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LIVING BIRD

For the Study and Conservation of Birds

WINTER 1993

J.R. WOODWARD

Holiday Greetings From the Lab of Ornithology!

All of us at the Lab of Ornithology extend our best wishes for a wonderful holiday season to you, our loyal members, and your families. Without your interest and support, our work on behalf of birds and the environment would be impossible.

We especially thank everyone who responded to our appeals in the last two issues of *Living Bird* to spread the word about the Lab to your friends or to purchase gift memberships. Your efforts have helped to increase our effectiveness as an international force for bird study and conservation.

CORNELL LABORATORY OF ORNITHOLOGY

For the Study and Conservation of Birds

A Publication of the Cornell Laboratory of Ornithology

LIVING BIRD

WINTER 1993 VOLUME 12 NUMBER 1

Greetings from Sapsucker Woods

Reading the paper every morning or watching newscasts on television, it's impossible to deny that the worldwide environment is in trouble. Acid rain, chemical pollution, a hole in the ozone layer—it's enough to drive anyone to despair. But fortunately there is another side to the story. More people than ever are committed to improving the quality of life on this planet, for humans and all the other living things that inhabit Earth.

In this issue of *Living Bird* we are highlighting some of the success stories, on a large and a small scale. Our centerpiece is a feature on Antarctica, showing how countries are working together to preserve the area's fragile ecosystem. On a local level we look at an Arkansas wildlife refuge that is turning farmland back into hardwood swamp and also at a Christmas tree grower in New Jersey, who has turned his farm into a welcome haven for wildlife. In "Beyond the Field Guide," Rick Bonney shows steps you can take to save vital bird habitat in your area.

As we kick off another publication year at *Living Bird,* we thank you for your continued support. Best wishes for the year ahead!

— *Tim Gallagher, Editor*

Cover: *Rufous-sided towhees are secretive birds that spend most of their time in the underbrush, scratching the ground for seed. To capture this stunning portrait, nature photographer Darrell Gulin sat for hours shivering in the snow behind his home in western Washington state.*

Right: *"Formal Attire Only." Each chinstrap penguin sports a built-in black tie—the perfect accent to its tuxedo-like plumage. Read about Antarctica, land of the penguins, on page 20. Photograph by Wolfgang Kaehler.*

Back Cover: *Nothing's more bracing than an icy plunge in the Antarctic surf, especially if you're a penguin. Wolfgang Kaehler photographed this lively group of chinstrap penguins on one of his many excursions to the southernmost continent. See page 20.*

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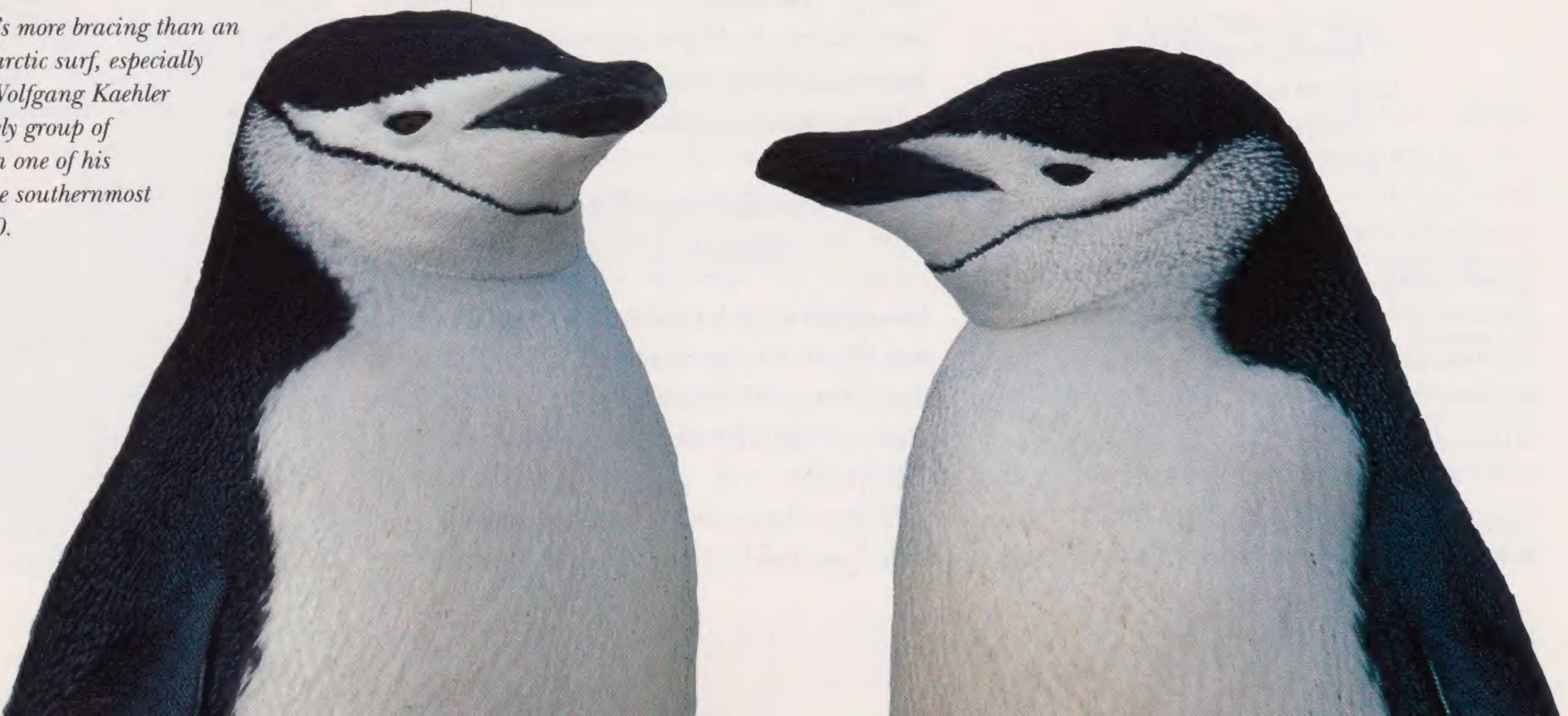

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WINTER 1993 VOLUME 12 NUMBER 1

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts.
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Printing by Cayuga Press, Ithaca, New York
Color separations by Brodock Press, Inc., Utica, New York

Letters

One Size Won't Fit All

My husband followed exactly Scott Shalaway's plans for a bluebird box ("A Basic Box for a Basic Need," Spring 1992). Mr. Shalaway advised your readers to "expect the unexpected when you check your boxes." We do, but a pair of dead tree swallows went far beyond any expectations we might have had.

We sorrowed but like idiots trusted science more than our instincts. I removed the dead birds, hoping bluebirds or other swallows would come. Tree swallows did, and we found another dead bird in the box. It was just too deep for the birds to negotiate.

Please, make some correction, for your readers who want to attract a variety of birds, and for the birds' sakes, too.

Marjorie Alspaugh
Simsbury, Connecticut

David Winkler, a Cornell University professor who studies tree swallows, replies: Box depth is not the problem. Tree swallows return to their breeding areas before the insects they eat are available in large numbers. If a cold front moves in, the birds face high metabolic costs and a reduced food supply. They roost in nest boxes to save energy, and some may perish in the night from cold and lack of food.

One aspect of box construction that contributes to mortality throughout the breeding season is the type of lumber used. High quality lumber is more durable than rough-cut lumber, but it's also smoother, and swallows can't get a foothold to exit the box. Use rough-cut lumber, or fasten a rectangle of rough material to the inside front wall. A piece of old window screen works well.

Testimony from the Believer's Club

Thanks for Jack Connor's "Welcome to the Club" in the Summer 1992 issue. I can attest to the fact that a good attitude from an experienced birder can make a difference.

A year ago, on my first group birding trip, I spotted a juvenile gull that didn't look like any of the usual suspects—more than anything it resembled a juvenile ivory gull. Finally I summoned the courage to ask the leader. Ivory gulls don't come here, he said, so it couldn't be one. That was that.

Let's jump ahead to last spring, when I looked out the window and saw a hummingbird that I'd not seen before. I drew a few sketches and made some notes. After looking at my guides, I decided I had seen a violet-crowned hummingbird. Did I call the hotline? No—violet-crowneds don't live here. I'd learned my lesson: don't trust your eyes when they conflict with range maps.

Imagine my surprise when I read in the local Audubon newsletter that a violet-crowned hummingbird had been spotted 30 miles north a week before. When I called the hotline to say, "I saw it too," an excited man asked for copies of my notes. He sounded genuinely sad that I hadn't called—but hey, I wasn't going to make a fool of myself twice.

If that seed of doubt had not been sown, a lot of local birders might have seen this rarity. Thanks for reminding your readers to reach out and help those who are less experienced.

Siobahn Ruck
San Francisco, California

A friend had a similar experience one winter. An acquaintance told her that a black-throated blue warbler had been coming to her feeder almost every day. She dismissed it as a misidentified junco.

Later, when she went to investigate, there it was—a black-throated blue warbler in January, happily munching sunflower seed. So as Connor indicates, "Never say never!"

P.S. I checked "C."

Elizabeth F. Washburn
Charlotte, North Carolina

We welcome letters from readers.
Address letters to: The Editors,
Living Bird, 159 Sapsucker Woods
Road, Ithaca, New York 14850.

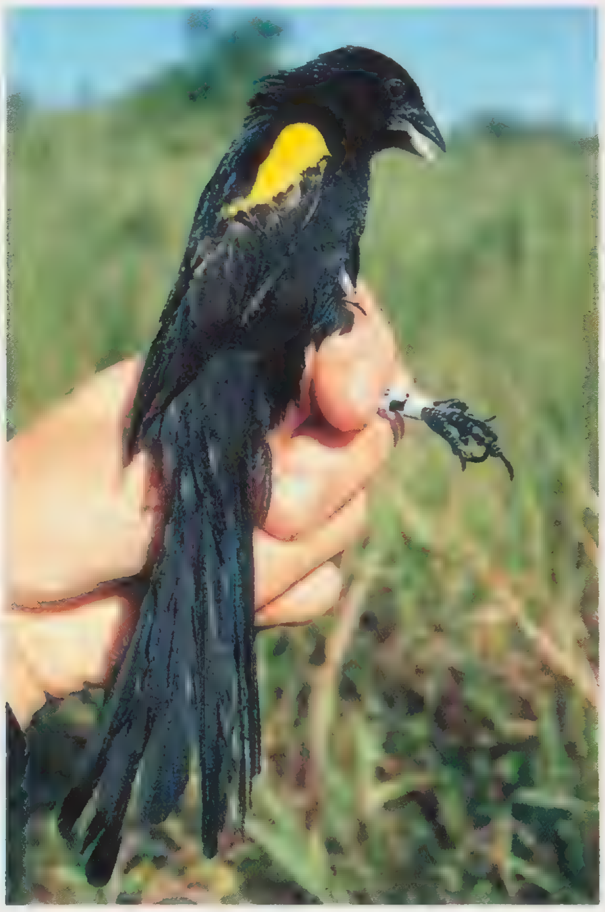
BirdNews

This year the venerable American Ornithologists' Union (AOU) held its 110th annual meeting on the campus of Iowa State University in Ames, Iowa, where participants enjoyed such local specialties as barbecue, baseball, and souvenir bags of home-grown popcorn. But first and foremost they reported on their research, in the field and in the lab, exchanging information on the latest developments in bird science from Anatomy to Zonotrichia. *Here are some of the AOU presentations Lab staffers liked the best.*

A Tale of a Tail

Glue a few extra centimeters onto the breeding-season tail of a male long-tailed widowbird and he's likely to attract extra females to his territory. **University of California-Berkeley** researcher **Udo Savalli** expected similar results when he traveled to Kenya to cut-and-paste tails of a closely related species, the yellow-shouldered widowbird.

Savalli was examining Charles Darwin's theory of sexual selection, which predicts that males will evolve conspicuous characteristics if these traits either (1) attract females or (2) equip the birds to defend their territories from other males. Several studies of sexual selection, including the long-tailed widowbird experiment, support the "female-choice" part of the theory.


UDO SAVALLI

Male yellow-shouldered widowbird with tail extension.

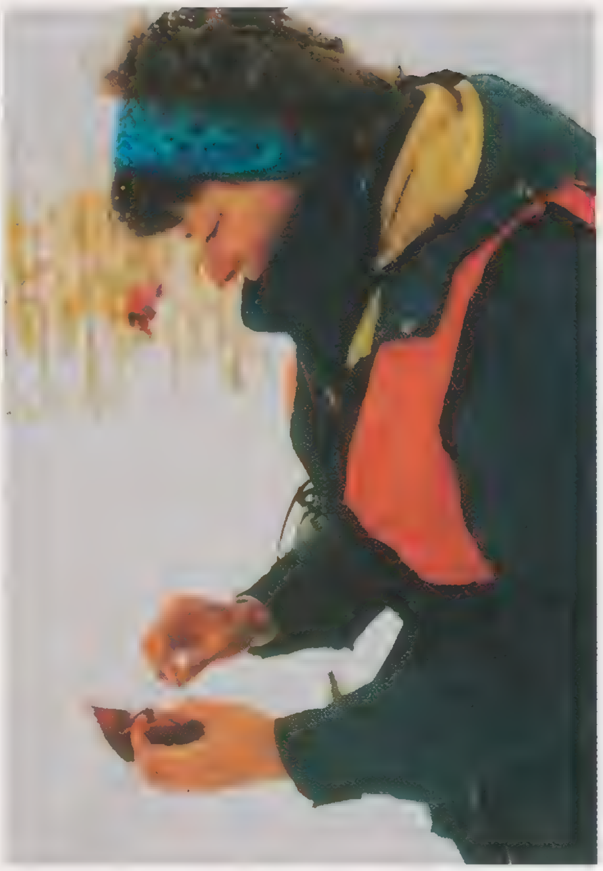
But Savalli found that extra-long-tailed yellow-shouldered widowbirds attracted no more mates than did normal and control males—nor even, for that matter, males with experimentally *shortened* tails. The short-tailed birds were, however, significantly more likely to lose their territories—a finding more in keeping with the "territorial defense" part of Darwin's original hypothesis. Savalli's findings add to the body of evidence that status-signaling plumage—not just weaponry such as a large beak or talons—can be selected for by competition between males.

That leaves the question: how *do* female yellow-shouldered widowbirds choose mates, if they're unimpressed by magnificent tails? Savalli's study suggests that females pick males who build a large number of cock's nests (incomplete nests), perhaps a more practical display of fitness.

Coping with Cold

Life is tough for winter-resident birds in North America: energy demands are high, but short days leave less time for foraging. What's a bird to do? **Terry Root** of the **University of Michigan** and **Jeff Price** of North Dakota's **Prairie Wildlife Research Center** compared winter ranges and physiological, behavioral, and ecological data for 106 species, looking for a pattern that could explain how birds cope with the cold.

They found that for most species, the northern range limit was where nighttime temperatures were so cold that birds had to increase their metabolic rate to 2.5 times the basal metabolic rate (BMR) to make it through the night. In other words, physiological constraints limit how hard a bird's body can work to maintain body temperature, so a bird had better not live where it can't keep warm.


STEPHEN H. SCHNEIDER

Feeling the chill: Terry Root and a mist-netted northern cardinal.

The researchers then divided the birds into two groups—nonmigrants and birds that migrated *within* North America. They found that although the vast majority of migrants have their northern limit right at the 2.5 BMR line, some residents winter north of it. As it turns out, most of these species make significant use of energy-conserving strategies, for example roosting in cavities or shelters, caching food, and feeding in flocks. Residents that winter south of the line use fewer of these strategies.

Hot Colors Aren't Cool

Baylor University professor **Kevin Gutzwiller** wears a blaze orange vest on winter point counts in central Texas—he doesn't want to be shot accidentally by quail hunters. But Gutzwiller and colleague **Heidi Marcum** wondered whether the bright color was also advertising the researcher's whereabouts to woodland birds. After all, most birds have excellent color vision, and in a bird's world color communicates such essential information as the status of a

COMPILED BY CYNTHIA BERGER

flockmate or the location of food. If birds were being attracted—or repelled—by the vest, the accuracy of Gutzwiller's counts would suffer.

So Gutzwiller spent the midwinter months of 1987 and 1988 testing how birds responded to his sartorial status. He completed 167 20-minute unlimited-distance point counts in two woodland-prairie regions of central Texas, wearing the vest for one random half of the counts. Although he detected essentially the same number of species regardless of his attire, a few species seemed to be repelled by the bright color. Specifically, of the 13 species detected during more than 25 percent of the count periods, he spotted two—tufted titmouse and American goldfinch—significantly less often with the vest than without, and Carolina chickadee somewhat less often.

Although this study wasn't designed to explain why the birds avoided orange, the "species-confidence hypothesis" predicts that birds will prefer colors characteristic of their own species and avoid atypical colors. Of the 13 study species, all six with red or orange as a conspicuous part of their plumage were apparently unaffected by the vest.

Gutzwiller recommends that researchers do pilot studies to test how color affects particular species before conducting point counts. If bright colors must be worn for safety, the counts can be adjusted accordingly.

CONSERVATION CHALLENGE IN BRAZIL

A narrow strip of coastal rainforest in the Brazilian state of São Paulo gets plenty of media attention for its endangered endemic species. But putting the spotlight on the rainforest shortchanges other endangered species in less well-known habitat, according to Brazilian ornithologists **Edwin O. Willis** and **Yoshika Oniki**. Drawing on more than 15 years of their own research and other studies from as long as 170 years ago, Willis and Oniki say many more bird species are at risk in the dry habitats of the São Paulo interior than in the well-publicized rainforests.

Of the 752 bird species that have been recorded in São Paulo, the researchers documented 69 that have experienced serious declines. Of these, 54 have ranges centered in the western, interior region of the state, while only 15 are restricted to the eastern coastal or mountain forests. The natural habitats in the interior of São Paulo, dry forests and savannas, have been reduced to less than 1 percent of their original area as agriculture has expanded—first coffee and now sugarcane and oranges.

Although some interior species can adjust to life in human-created habitats such as orchards and pastures, many are not so flexible. The problem is compounded because conservation initiatives have so far completely overlooked the dry interior regions; furthermore, much of the area is controlled by wealthy landowners who farm for the export market. Willis and Oniki urge conservationists both in Brazil and abroad to take a broader view of the situation in São Paulo.

EVOLUTIONARY HISTORY OF BLACKBIRDS

Blackbirds in the genus *Agelaius*—the red-winged blackbird is one familiar example—are among the most thoroughly studied birds in the history of ornithology. Despite the volumes that have been written about blackbird behavior and ecology, the evolutionary relationships between species within the genus aren't clearly understood. This lack of information poses a problem, according to **Scott Lanyon** of Chicago's **Field Museum of Natural History**: a historical perspective is essential for ornithologists who want to use the wealth of behavioral and ecological knowledge to generate or assess hypotheses of behavioral and ecological evolution within the genus.

BARBARA CLAUSON

Scott Lanyon contemplates the evolutionary history of a South American blackbird, the solitary cacique.

Traditionally, taxonomists have grouped the nine blackbird species that compose the genus *Agelaius* on the basis of a gestalt impression of the birds' size, shape, habitat, and behavior. Lanyon, however, examined the evolutionary history of *Agelaius* using a recently developed technique that minutely examines the structure of each species' DNA. Specifically, he looked at the structure of a gene—a segment of DNA—that codes for a protein called cytochrome b.

Lanyon found that *Agelaius* is actually polyphyletic—members of the group are descended from more than one ancestral line. For example, although red-winged and tricolored blackbirds *are* closely related to one another, the two species are more closely related to other non*Agelaius* North American blackbirds such as grackles and Brewer's blackbirds than they are to the South American members of *Agelaius*. In light of this finding, says Lanyon, earlier hypotheses about the *Agelaius* group that assumed the nine species were closely related should be reevaluated.

MAPPING MEMORY

To get ready for winter, a typical Clark's nutcracker may hide 30,000 conifer seeds in 6,000 separate holes in the forest floor. Luckily, the birds aren't absent-minded: research shows that they have excellent spatial memory and may rely on landmarks—a tree or a stump, for example—to relocate their caches. Researchers **Alan Kamil** of the **University of Nebraska** and **J.P. Balda** of **Northern Arizona University** wondered whether nutcrackers use an additional memory aid, direction of approach.

They measured whether the birds approached their hiding places from the same direction to retrieve seeds as

STEPHEN LONG (University of Massachusetts Photo Services)

Alan Kamil with one of his memory experts: a Clark's nutcracker.

they did during the original caching—behavior that would suggest nutcrackers can remember a particular route. They used a specially designed experimental room in which the floor was dotted with an array of small holes, some filled with sand and some capped with wooden plugs.

Four wild-caught nutcrackers were videotaped as they first cached seeds in the sand-filled holes, and then, some days later, recovered the seeds. Kamil and Balda found that the birds did tend to approach the cache sites from the same direction during caching and recovery. But they made recoveries from a new direction fairly often, and seemed to make no more errors using this strategy than they did using the consistent approach. So, instead of relying on direction as a memory aid, nutcrackers may generate a kind of "cognitive map," one that is not dependent on any single landmark or set of landmarks.

THE IMPORTANCE OF BEING FAITHFUL

A vagary of the weather created ideal conditions for **Cornell University** graduate student **Hsiao-Wei Yuan** to test the connection between site fidelity and mate fidelity in common terns. In this species, pair-bonded males and females spend the winter apart in Central or South America but often reunite at the North American nesting site they previously shared. Studies of other long-distance migrants suggest that site fidelity promotes mate fidelity; after all, two birds can't pair if they can't find one another. Furthermore, both kinds of "faithfulness" enhance reproductive success; the pair spends less time on courtship and site selection, and so gets a jump on the breeding season.

Yuan had been following the reproductive success of tern pairs in a colony on Central New York's Oneida Lake when an unexpected flood in early spring of 1990 evicted incoming terns from the nesting area. After the flood waters receded two weeks later, the birds came back to nest, but Yuan found that mate fidelity was significantly lower than it had been in previous years.

What's more, mate-faithful birds didn't seem to have a reproductive advantage over "unfaithful" birds, although this had been the case in earlier years. Yuan hypothesizes that during the flood, while the birds were dispersed around the lake and unable to locate their accustomed nest sites, many formed new pair bonds. Then, when the birds were finally able to start breeding, "faithful" birds had no particular advantage over the newly bonded pairs—the breeding season had been delayed for all.

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TAKING CHARGE

by Rick Bonney

Can concerned birders save disappearing habitat? Sure!

I grew up in Parsippany, New Jersey, in the mid-1960s. Gas ran a quarter a gallon, candy bars cost a nickel each. My street, located in a pleasant housing development known as Glacier Hills, backed up against the woods—acres and acres of woods where my best friend, Brad Harden, and I would disappear for hours.

We'd visit Woodpecker Thicket, a tangle of dead oaks and tulip poplars that was always full of downy and hairy woodpeckers, *pikking* as they circled overhead.

Or we'd check out Box Turtle Hollow, a glacial depression filled with dead leaves, moist soil, and turtles galore.

Or we'd wade in the creek, its banks full of frogs. We'd search for spotted salamanders hiding under rotting logs. And we'd slop through Buttonbush Swamp looking for blackbird nests.

But one spring, on a Saturday morning when the air smelled like snakes and our blood raced for the hills, we were out birding when we saw something we'd never expected. Survey tape! Orange flagging, hanging from stakes and fluttering from branches, running for hundreds of yards along one of our favorite trails.

You know the rest of the story. Remember, this was before Earth Day. This was a time when my dad, who lectured to the Boy Scouts on saving hawks and owls, was seen as pretty screwy. My mom, after the time she showed my sisters how to use a butterfly net in clear view of the neighbors, was obviously wacko too. So their inquiries into the future of our local wilderness, hampered from the start by a lack of precedent, were quickly hamstrung. Within a year Box Turtle Hollow, Woodpecker Thicket, and Buttonbush Swamp had been permanently transformed into "Glacier Heights."

Such is life, right? Not necessarily. Times have changed. Today, had Brad and I known what to do, we probably could have stopped or at least pared down the size of that development, because much of it was built over wetland that could now be protected by law. Getting in the way of "progress" is not always easy—in fact, it's often painful. On the other hand, it can be very rewarding.

Can you, a mere bird watcher concerned about disappearing bird habitat, really help to save it? Sure. Hear the words of Margaret Mead: "Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has."

So you have a problem on your hands. Maybe your local swamp is about to be drained for a new shopping center. Or the only woodlot in your neighborhood big enough to hold breeding tanagers is about to be razed for new homes. What should you do?

First, realize that some environmental fights are not worth the effort. When faced with an apparent catastrophe, ask yourself: How critical is this problem? How much does it affect the perpetuation of local or global natural processes? Does it involve the destruction of a unique natural area, or one that is replicated by many other areas nearby? Does it involve the local extinction of a species or subspecies?

For example, when deciding whether to protest a proposed logging operation, you must consider such questions as these: Does the woodland to be cut contain old, mature trees, or just scrubby

GEORGE SANGRIK

A woodlot that supports breeding tanagers is about to be cleared. What should you do?

second growth? Is the vegetation native to the site, or is it growing there because of disturbance? Are any of the plants and animals that inhabit the woods threatened or endangered on a regional or national scale? And how does the woodland fit into the larger landscape—is it isolated, or does it form part of a critical wildlife corridor or a network of natural areas?

These questions may seem daunting. Nevertheless, addressing them to the best of your ability is of critical importance in assigning priorities to environmental efforts.

Here are some examples of ecologically trivial issues: the death of individual animals; hunting common species (although certain declining species, including many ducks, should receive more protection); the fate of a few trees in a parking lot; a housing development in an isolated second-growth woodlot.

On the other hand, it is ecologically appropriate to defend all remaining high-quality natural areas, such as wetlands, tracts of old growth, large, contiguous forests and prairies, and corridors that connect such lands.

Once you've decided that an issue is worthy of your attention, what do you do? Although there's no sure-fire recipe for action, several steps can be taken.

■ First, look for a local group that might take an interest in your problem. Check to see if you have an active Audubon chapter, a local Sierra Club group, or a chapter of the Izaak Walton League in your community. And don't overlook traditional bird clubs—many have active conservation committees that are becoming increasingly concerned about land protection issues. If you can identify a supportive group, call its president or conservation chair and ask for help. And if you can't find a local environmental group, start a new one! Call it "Friends of Big Swamp," whatever.

■ Next, learn all you can about the issue. Good information sources are your state natural resources agency, a local environmental management council, or whatever group is involved with conservation issues in your area. Staff and faculty at local colleges or universities often will go out of their way to help. If you encounter unresponsive government officials, remind them (politely) whose money is paying their keep.

■ Using the facts you've learned, develop a position statement. Explain exactly why you are opposed to the development. Define all the negative consequences of habitat destruction and the positive reasons for land protection, from both human and nonhuman perspectives.

■ Publicize your position statement. "Conventional wisdom" is defined by people who speak out, so let the world know how you feel! Write letters to the editor of your newspaper, get on local talk shows, speak to groups: local business associations, bird clubs, anybody who will listen. The power of information is magnified by the number of people who have it and use it.

The power of information is magnified by the number of people who have it and use it

■ Build alliances. For example, a local tourism council may be concerned about a project that will affect recreational opportunities in your area. Hunting and fishing clubs can also be a tremendous source of support; without habitat, neither hunters nor anglers have a place to practice their sport.

■ Stage an event. This not only involves the community, it makes news. For example, you might sponsor a public lecture on the issue by a prominent citizen, or a bird walk or a clean-up project in the area in question. Making news is important, because reporters seldom pay attention to simple position statements.

■ Visit elected officials and tell them why they should oppose the project. If you can't visit, write. Opinions from constituents are still the most important factor in decision making by public officials.

■ Seek *pro bono* legal help. Many law firms have attorneys who are happy to lend assistance to environmental groups. It doesn't hurt to ask—but make sure you know exactly what you want before you do.

■ Avoid compromise. And if that sounds unreasonable, just remember the point to which we've come. We've already lost 95 percent of our nation's old growth, half our wetlands, innumerable species, and even more subspecies. "Compromise" was reached long ago.

■ Don't be afraid to be emotional. Some folks will tell you this is the worst thing you can do. The truth is, arguments are seldom won or lost by facts—outcomes hinge on who does the best persuading. If we birders are going to save bird populations, it'll happen because we want to see birds and share the Earth with them, not because birds keep down pest populations or hold the cure to cancer. So speak from your heart.

Does this process really work? Not all the time, but often enough to make it worthwhile. Consider just a couple examples of what local citizen action has prevented: creation of a jetport in the Great Swamp National Wildlife Refuge in New Jersey; the draining of Mono Lake, California.

In the greater scheme of the universe, these victories may not sound like much. But if every community had a group keeping vigil and doing everything in its power to ward off ecological calamities, not only birds but all sorts of plants and wildlife would be ensured a better future.

I wish I'd known all this back in 1966—maybe Parsippany, New Jersey, would have a few more woodpeckers and box turtles today. But let's not dwell on the past. Let's look ahead. ■

Further Reading

Hoose, Phillip M. *Building an Ark—Tools for the Preservation of Natural Diversity Through Land Protection.* Washington, D.C.: Island Press, 1981.

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PARADISE RESTORED?

Replanting the "Great Swamp" of Arkansas

A century ago the Cache River basin, above, was an enormous swamp filled with colossal oaks and cypresses—a paradise for wildlife. Then most of it was drained and cleared for farming. An ambitious restoration project at the Cache River National Wildlife Refuge may turn back the clock and restore the original swamp forest habitat.

MARK MORGAN

by Mel White

In these declining years of the Century of the Automobile, going from Memphis to Little Rock is an easy drive: just cross the Mississippi on the Hernando de Soto Bridge; heading west on Interstate 40, pick your way through the dodge-'em cars at the I-55 interchange, thumb on the cruise-control, and that's that—two and a quarter hours. Closer to three if it's lunchtime and you stop for a sandwich at Craig's Barbecue in DeVall's Bluff.

It's a quick trip, all right, but somewhere along the way it would be instructive to consider a time when it wasn't so easy. At best it entailed a major expedition; at worst it was impossible. Those were the days, in the mid-19th century, when the intervening landscape was known as the "Great Swamp of Arkansas." That was one of

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the printable names, at least. Travelers whose wagons disappeared into mucky bayous no doubt used other words.

Not everyone reviled the infamous Arkansas bottomlands, though. German adventurer Friedrich Gerstacker wrote in the 1840s of the "terrible, broad swamp" he found here, but a few pages later rhapsodized that it was "covered by the most wonderful, luxuriant primeval forest one could imagine in all the earth." Within that forest lived wildlife in overwhelming abundance: bear—so many that Arkansas's nickname was once "The Bear State"—panther, deer, raccoon, turkey, bobcat, and in winter ducks beyond number. Pioneer hunters used one word over and over to describe what they found in eastern Arkansas: they called it paradise.

As it turned out, the Great Swamp didn't remain terrible, or primeval, for long. When the frontier moved west the swamp was ditched, drained, and confined to a few places where the spring rains couldn't be tamed. The forest is mostly gone now—the colossal overcup oaks and the room-sized cypresses—and with it most of the wildlife. Not much finds a home in the rice and soybean fields that flank Interstate 40 through the Arkansas Delta.

MARK MORGAN (2)

Paradise lost, you think, as the Memphis station fades out and you punch the SEEK button on the stereo. Another bad-news story, and who are we to criticize deforestation in Brazil?

But wait. Pull off at Exit 202, here where there's nothing at the interchange, not even a gas station, and drive north on Highway 33 a few miles. Now stop.

Big deal, you say. It's just another farmer on his tractor, getting his beans planted.

Look closely. See the U.S. Fish and Wildlife Service patch on his shirt? His John Deere Model 7100 MaxiEmerger planter isn't loaded with soybeans or corn. The hoppers are full of acorns. This man is planting a forest.

More to the point, he's creating a new national wildlife refuge, a place for feathered and furry—and scaly—things in a world of row crops and pastureland. The Cache River National Wildlife Refuge, named for a middling-sized stream that squiggles down from the Missouri bootheel to the White River, is only a fledgling as refuges go: less than 10 years old and still growing, encompassing about 22,000 acres of scattered tracts along the river drainage. But this small beginning is a very good-news story indeed. In fact, it represents one of the most important recent successes of the American conservation movement. Just how important was shown in 1990 when the Cache and the lower White River into which it flows were collectively named a "Wetland of International Importance"—only the eighth such area in the United States, in the same class as the Everglades and Okefenokee Swamp. The major part of this wetland is contained within the swampy forests of the 113,000-acre White River National Wildlife Refuge, farther south; add the Cache Refuge, at its projected size of 54,000 acres, and several adjoining state wildlife management areas, and the result is one of the most significant natural areas in the South.

For those who believe that wildlife refuges are born, not made, the sight of the tractor out in that old soybean field might be confusing. Thinking of wild places like Anahuac in Texas or Back Bay in Virginia, some might assume refuges are created by the stroke of a pen on a map, circumscribing forests, swamps, prairies, or marshes and storing them away for protection. That method worked fine when there was still land around no one much wanted. But what about today, in the Interstate Age, the Agribusiness Age, the Planned Community Age, when any little patch of trees is likely to be coveted by everybody from preservationists to shopping mall developers? Today it's likely to take a little more effort.

For well over a decade, back in the 1970s, the Cache River basin was the focus of a bitter struggle between conservationists, who wanted to save the flood-prone bottomland hardwoods along the river, and landowners, who wanted the U.S. Army Corps of Engineers to straighten the river and improve drainage so they could clear more acreage. The Corps called their plan "channel improvement"; conservationists called it "gutterization." Bottom line, it was a contest between the soybean and the mallard.

Between 1950 and 1970, the rise of soybeans transformed agriculture in the South, and in so doing transformed the landscape; in Arkansas, for instance, soybean acreage increased 750 percent in that period. In the Cache basin alone, well over three-quarters of the original 1.2 million acres of bottomland hardwoods had been cleared, much of it to make way for soybeans, by the time Congress approved a $60 million Cache drainage plan in 1970.

The destruction of native woodland affected hundreds of species of plants and animals; the Bachman's warbler, for instance, now perhaps extinct, was once considered "a moderately common breeder in the Sunken Lands of northeastern Arkansas." But none symbolized east Arkansas more than the mallard. Sportsmen considered the wooded swampland of Arkansas one of the great duck-hunting areas in the United States; they saw their bag limits reduced year by year, and they listened when biologist Frank C. Bellrose, arguably the country's leading expert on waterfowl, called the Cache basin the most important mallard wintering grounds in the entire world. When conservationists joined together to challenge the destruction of the Cache River, hunters stood side by side with bird watchers and biologists.

The history of the drainage plan in the 1970s was one of political deals, lawsuits, and failed compromises. The Corps and its backers pushed hard for the project, but the growing environmental movement turned the tide. In 1978, the year that a government study called the Cache plan "the single most damaging project to waterfowl in the nation today," Congress cut off all appropriations for channelization. Eight years later, a bill passed providing the first federal funds for the new Cache River National Wildlife Refuge.

It sounded like a victory not just for ducks but for all the other species that make their homes in the Delta: yellow-throated vireos and yellow-bellied water snakes, pileated woodpeckers and painted turtles, redstarts and rice rats. But only fairy tales have perfectly happy endings. Even though the Cache was saved from ditching, deforestation had continued. The price of soybeans, which had been $2.13 in 1960, averaged $7.91 in 1980, and farmers had continued to cash in on the boom. When the Fish and Wildlife Service arrived on the scene there was still woodland along the flood-prone river edges, but in much of the area trees were scarcer than ever.

Refuge manager Dennis Widner, above, looks at the cropland that the U.S. Fish and Wildlife Service is buying up and envisions what the land could become again—a pristine bottomland hardwood swamp, far left.

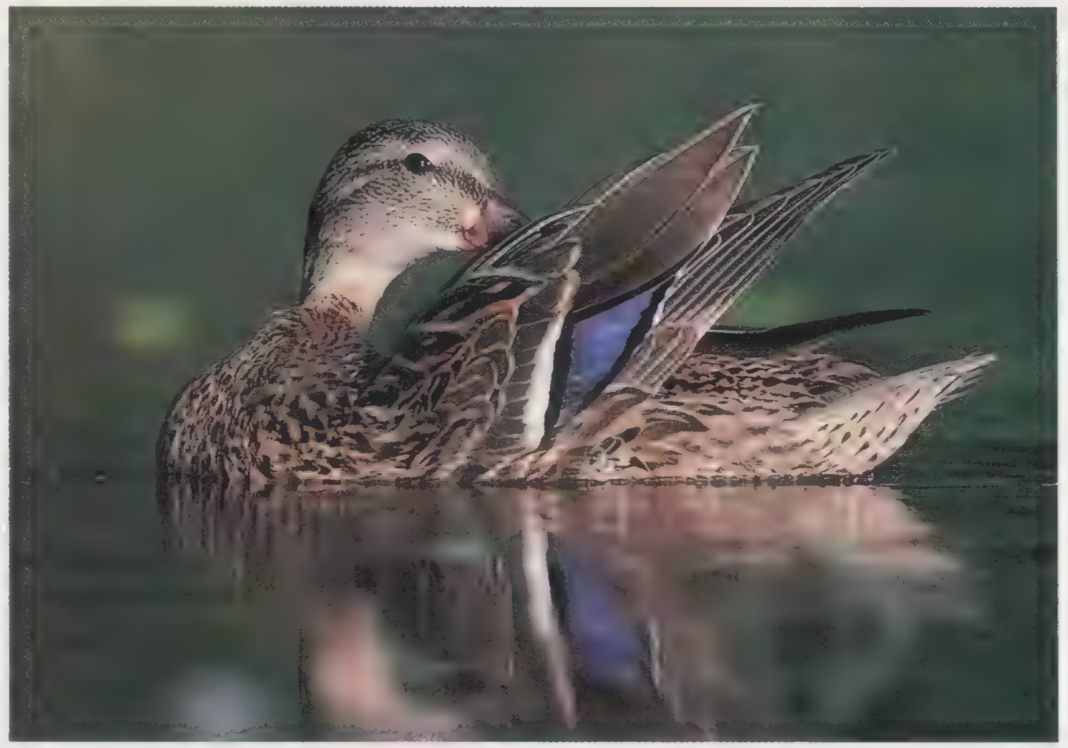
All of which brings us to what that man is doing out there on his tractor, punching holes in the wet dirt, planting those acorns.

Before Cache River manager Dennis Widner came to eastern Arkansas he was at Savannah National Wildlife Refuge in Georgia. It's pretty country over there, but he didn't much like his assignment. At Savannah, all he had to do was keep watch over a stretch of coastline that was already wild and natural; he prefers hands-on managing.

"I like to look at a place and say, 'If we do this, this is what will happen,' and then go out and do it," he told me one April day as we rode around in his government-issue Chevy Blazer. Naturally, the process of inventing a new national wildlife refuge on the Cache River suits him fine.

Of course, it would be great if Dennis Widner could draw up a wish list of just what he'd like in the refuge. A couple of hundred thousand acres of virgin bottomland hardwood would do nicely, but that dream habitat doesn't even exist anymore, with or without a "For Sale" sign. What's on the market in the Cache basin today is mostly farmland that has declined in value with the price of commodities. More than a few farmers are trying to sell land that's no longer worth what they borrowed to buy it.

The Fish and Wildlife Service was at first reluctant to acquire cropland for the refuge. Trying



SCOTT NIELSEN (2)

The Cache River basin is one of the most important wintering grounds in the world for mallards, above. A female mallard, above right, needs the nuts and invertebrates abundant in flooded woodlands to produce eggs effectively.

above all to save the still-existing natural woods, it was buying mostly areas in the upper reaches of the Cache. There, Widner says, land has been cleared right to the river's edge, and what's left is mostly a "braided channel" forested in tupelo and cypress. It's pretty to look at, but it's not particularly productive for wildlife, and, as Widner says, "there's no way anyone's ever going to get a bulldozer on it." That part of the Cache is fairly safe from clearing for now, whether it's officially protected or not.

Dennis Widner has spent the past few years persuading his agency to buy cut-over farmland in the lower Cache basin. This, he is convinced, can be the heart of the refuge, if people will give it time. The oaks he's planting today will be the vanguard of a once and future primeval forest.

As we drove along a highway near the lower river, he pointed out fields muddy, or in some cases still flooded, from winter and spring rains. "The land looks bad now," he said, "but you must look 50 years down the road." When Dennis Widner looks that far ahead, he sees that what was once the Great Swamp can still be a great swamp. Here is where he puts his acorn planter to work, reversing deforestation, resurrecting wetlands where someday mallards will again float down through the trees on back-pedaling wings, quacking their green heads off.

Nobody is happier about the Cache River refuge than Scott Yaich, wetlands coordinator for the Arkansas Game and Fish Commission. Yaich is also the Arkansas team leader for the North American Waterfowl Management Plan (NAWMP), an ambitious agreement, signed by the United States, Canada, and Mexico, that aims to restore declining waterfowl numbers to mid-1970s levels. Duck populations rise and fall in weather-related cycles, so a one-year drop is not necessarily cause for alarm. But recent trends have biologists worried. The overall duck population in North America has been steadily declining for decades; despite small gains in the past two years, mallard numbers are still down 17 percent compared with the 1955-1991 average. American wigeons are down 16 percent, and northern pintails are down 54 percent.

As for the role of Arkansas in the NAWMP, "waterfowl" translates to "mallards," and mallards translates to the Cache and lower White rivers. "The Cache-White River area is the flagship of the lower Mississippi valley region," Yaich says. "Especially if you look at a satellite photo, this area just jumps right out at you as the last contiguous expanse of bottomland timber in this part of the Mississippi valley."

And ducks need bottomland hardwoods. Despite what drainage backers once claimed, flooded rice and soybean fields alone won't do. Ducks form pair bonds by January, Yaich says, and they need "dense scrub-shrub" areas for their mating rituals. They need resting areas in flooded timber where they can prepare for their northward migration unmolested. Yaich says that mast—acorns and other nuts—"provides nutrients that they simply can't get anywhere else. Proteins and fats are most available in bottomland hardwoods." At certain times of the year, ducks depend heavily on invertebrates—worms, bugs, and other crawly things—which are vital to females trying to produce eggs; these, too, are more abundant in flooded timber than in wet fields, where their numbers are affected by pesticides.

"The production of ducks in Canada is tied to the rainfall on the wintering grounds," Yaich says. "The Cache River doesn't become good waterfowl habitat until we get enough rainfall to drive it out of its banks."

This might be a good place for a quick reminder: the whole point of the Cache drainage project was to keep the river *within* its banks.

Dennis Widner drove me to a farm near Little Dixie, in Woodruff County, for a look at his acorn planter. He does the same thing with local landowners interested in reforesting their property, showing them how easy it is to modify their planters for oaks instead of soybeans. He said he had encountered no bitterness toward the refuge as a result of the long fight over channelization. Most of the land he'd like to buy was converted to crops in the 1970s, when various arms of the federal government were urging farmers to clear more land, plant more soybeans, invest more money. In the farm bust of the 1980s, they were left holding the bag. Many farmers see the refuge as a way to get part of their money back, and at the same time help save a part of the Delta that they, too, know is fast disappearing.

Many of us dream of having places where nature just gets a good leaving-alone, but in an environment like east Arkansas's, so thoroughly ditched and drained, cut over and plowed under, things are more complicated. What's happening at the Cache refuge might serve as a paradigm for conservation in the future: fight for the land that's left, and speed up the healing process where you can.

As we got into the truck and headed back toward the river, Dennis Widner took the long view.

"I enjoy doing things on these refuges to help waterfowl and other native species," he said. "This is a unique place, and I just look ahead to my grandchildren's time, more than what it is right now."

We bounced down a muddy track and stopped at the water's edge. Widner turned off the engine and we got out of the Blazer. Blue-gray gnatcatchers whined all around us. Prothonotary warblers whistled out in the woods. A red-bellied woodpecker hammered on a dead tree behind us. We watched as a swift, steady surge of water flowed over the road ahead. We were a mile and a half from the Cache River. ■

Mel White is a freelance writer and Arkansas native who is currently writing a birder's guide to the state.

BHL

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The Odd Couples

by James L. Hayward

When staying single doesn't make evolutionary sense, some gulls have a surprising solution

Birds are sexual creatures. No bird can split itself in two, amoebalike, to become two birds, and no bird can produce offspring from unfertilized eggs, as do some pond-dwelling zooplankton. Using innate rituals, male and female birds form pairs so they can reproduce. In some species the male and female pair only long enough to copulate. In other species they become lifelong partners and raise many broods together. But in any case, a basic axiom of bird biology is that a male and a female form a pair.

At least, that's what ornithologists believed until the mid-1970s, when George and Molly Hunt of the University of California at Irvine made one of the most surprising findings of ornithological history: pairs of female gulls. While studying a colony of western gulls on Santa Barbara Island, just off the California coast, the Hunts observed female pairs copulating, building nests, incubating, and raising healthy chicks.

The Hunts had been studying the gull colony for several years when they made this unexpected find. Western gull nesting behavior is typical of many gull species: monogamous pairs share about equally in incubating a clutch of three eggs and provisioning the nestlings. The Hunts noticed that each year, roughly 1 out of every 10 nests at the Santa Barbara Island colony was "supernormal," containing four to six eggs instead of the usual three. When they measured the intervals between egg laying, they found that new eggs appeared more rapidly in nests with supernormal clutches than in nests with three-egg clutches. In some cases, two eggs were laid on the same day, an impossible task for a single female gull.

The Hunts began to wonder whether two females might be sharing each nest. Male and female western gulls have identical plumages, so the researchers couldn't tell just by looking whether each pair actually consisted of two females or a male and a female. The only way to tell a gull's sex is by performing a surgical procedure called a laparotomy, in which a tiny incision is made in a bird's belly and the abdominal cavity is inspected for the presence of ovaries or testes. This commonly used procedure causes little pain and no long-term stress—birds are back on their nests within minutes of the operation.

The Hunts performed laparotomies on gulls tending both normal and supernormal clutches. They found that normal clutches were invariably tended by male-female pairs, whereas supernormal clutches were almost always tended by female-female pairs. The question of where all those eggs came from so fast had been answered: each nest had two egg producers instead of one.

But this discovery raised other questions. The Hunts occasionally saw a female gull mount her female mate in an attempt to copulate. Female gulls have no testes and are physiologically incapable of producing sperm, though, so these female-female copulations couldn't possibly result in fertilized eggs. Yet about 14 percent of the eggs in the supernormal clutches were fertile.

The Hunts found that although two females might form a pair bond to tend a nest, they sometimes engaged in extra-pair copulation. In the past decade scientists have noted this behavior in more than 100 species of birds, including many species long thought to be strictly monogamous. The Santa Barbara colony was a large one, including hundreds of male birds, so many female pairs had male "neighbors." It seemed likely that the viable eggs in the female pairs' nests had been fertilized by promiscuous males.

The Hunts wondered whether the female-pairs

JOE MCDONALD

phenomenon was restricted to western gulls, or whether female pairs occurred in other species. Surveying the literature, they found that ring-billed gulls were the only other species in which supernormal clutches had been noted with any regularity. So in 1978 George Hunt, together with Don Miller, a professor at Washington State University, and Miller's graduate student, Michael Conover, searched a colony of ring-billed gulls nesting at Sprague Lake, Washington. Not only did they find female pairs, but the California gulls nesting in the same colony also included some female pairs. Within a week of this discovery, in an independent investigation, John Ryder and Patricia Somppi of Lakehead University, Ontario, found female pairs among ring-billed gulls nesting at Lake Superior.

In contrast to the relatively high frequency of supernormal clutches in western gulls, ring-billed nests contained oversized clutches only 1 to 2 percent of the time. Depending on the colony, however, between 31 and 70 percent of the eggs in these ring-billed clutches were fertile. More recently, female pairs have been found among herring gulls, Caspian terns, and snow geese. Clearly the phenomenon is not restricted to western gulls, or even to gulls in general.

Another question the Hunts asked was whether female pairs make good parents. Gull chicks are semiprecocial; although they are born covered with down and walk soon after hatching, they cannot feed themselves and depend on solicitous parents to survive. Among ring-billed gulls, nests with supernormal clutches are sometimes positioned in less-than-optimal habitat—areas with little or no vegetation, or away from the beach—where the chances of reproductive success are generally low. Despite the poor-quality habitat, female pairs still defend their nesting territories just like successful male-female pairs. Female pairs of western gulls lay eggs that are smaller than normal, and in gulls, small egg size is sometimes associated with lowered chick survival. The fertile eggs in supernormal clutches often hatch, however, indicating that the female pairs have spent sufficient time incubating their clutches. And the chicks seem to receive adequate food and care from their two female parents. In short, female

Researchers George and Molly Hunt discovered that two female gulls sometimes team up to raise a brood: building a nest together, sharing incubation duties, rearing the chicks, and even copulating. Above, these western gulls are about to mate. Males and females have virtually identical plumage, and may use the same courtship behaviors.

Above, Molly Hunt in 1972, when the researchers first noticed supernormal clutches in western gull nests. This observation led to the discovery of female pairs. Head-tossing, below right, is a courtship display most often performed by female gulls. When two females court, neither one acts particularly "masculine." The two have normal levels of female sex hormones and cannot fertilize one another's eggs; instead, neighboring males do the job.

pairs are perfectly capable of raising young, even though they may do so under less than optimum conditions.

Perhaps the most intriguing question about female pairs is why they form in the first place. Does a female gull benefit by sharing a territory with another female instead of a male? Are female pairs an example of maladaptive behavior, or do they represent a reasonable adaptation to certain situations?

To examine this question, George Hunt and his colleagues compared the behavior of already-bonded female pairs to that of normal male-female pairs. They found that no behavior is used exclusively by males or females, although some behaviors are more commonly used by one sex or the other. For example, head-tossing, a courtship display in which the bill is thrown quickly upward, is usually performed by females. Courtship feeding, in which one bird regurgitates food for its mate, is performed mostly by males. Males also respond more actively to intruders than do females. Curiously, both males and females in a normal pair attempt to mount one another for copulation, although females do this much less frequently and much more clumsily.

The researchers found that in female pairs, neither member of the pair consistently showed more "masculine" behavior than the other. In fact, both members of the pair performed various behaviors with about the same frequency as females that were mated to males. Physiological studies showed parallel results: when the researchers measured the levels of sex hormones in the blood of normal and female pairs, they found that neither member of the female pair was chemically more "masculine" or "feminine" than the other.

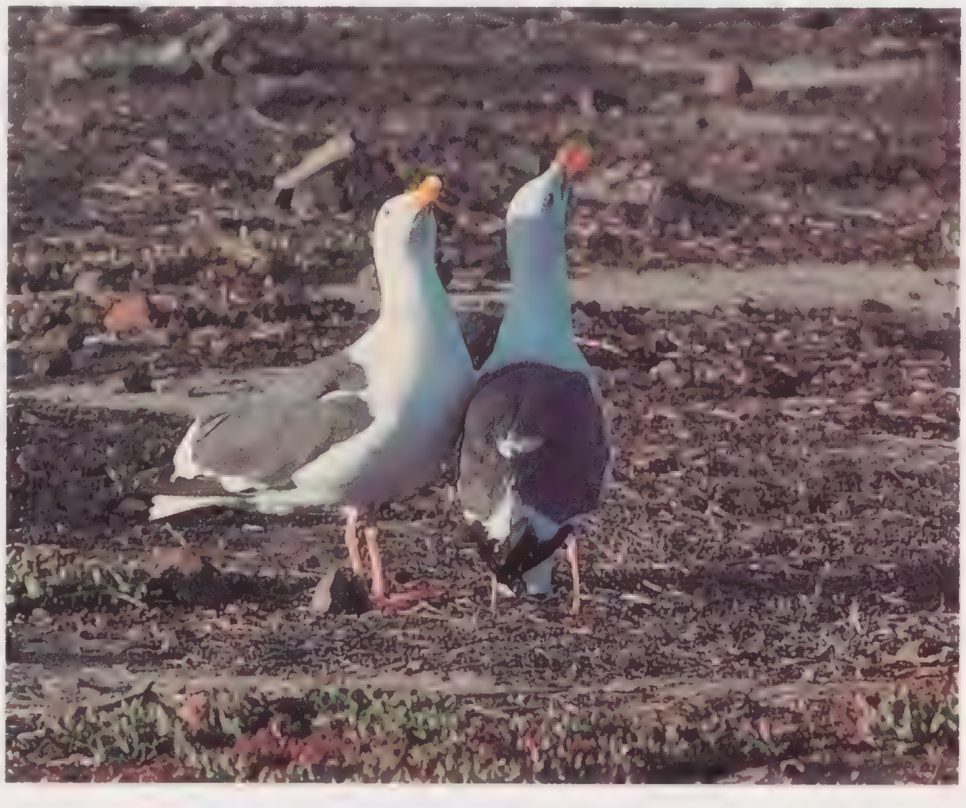
So why do two females—females that exhibit similar behaviors and have similar hormone levels—pair up? The immediate answer is simple: There aren't enough males to go around. Why not? The answer to this question is more complex, as the accompanying sidebar explains.

In any case, a female gull who can't find a male mate may gain some advantage by setting up housekeeping with a member of the same sex. Since male gulls are sometimes promiscuous, members of a female pair can get some of their eggs fertilized. Two sets of eyes are better than one at detecting predators. And while one member of the pair is away feeding, the other can defend the territory. Given these advantages, staying single doesn't make evolutionary sense. Leaving *some* offspring is better than leaving none.

The pair bond between two females can last for years, just like the bond between a male and a female. Scientists and the media sometimes use terms like "homosexual," "gay," and "lesbian" to refer to these avian alliances. Given what we know about why female pairs form, however, it's probably inappropriate to say that female pairings among gulls are similar to homosexual pairings among humans.

There is still much that we do not know about female pairs in birds. The little that we do know leads us to recognize that we cannot always define natural processes in terms of our past understanding. Surprise awaits us around every corner, forcing us to continually readjust our assumptions about life and how it operates. ■

James Hayward is a professor of biology at Andrews University, Berrien Springs, Michigan. He researches fossil eggs and living birds, including gulls.



GEORGE HUNT (2)

The Rest of the Story

by Michael Fry

The observation that female gulls pair up when males are in short supply demonstrates an important evolutionary point: A gull's goal is to reproduce, by inventive means if necessary. But why do female gulls need this unusual reproductive strategy in the first place? Where did all the males go?

One explanation is that male gulls have higher mortality rates than females. Juvenile males in particular tend to fight and take risks—much like human juveniles—with sometimes fatal consequences. But the difference in mortality rates for males and females, though measurable, is small.

A situation that can result in a significant shortage of males is population expansion. When a gull colony gets too big, birds leave to form new colonies. Females are more likely to migrate than males, which tend to breed in the colony where they were born. As a result, newly formed gull colonies have many more females than males.

Neither of these explanations applies to the Santa Barbara Island colony; there, the cause was chemical. Here is what happened.

In the late 1960s, before the Hunts' study, the pesticide DDT was still legal in the United States. In fact, not far from Santa Barbara Island, the Montrose Chemical Company was manufacturing DDT and discharging millions of pounds of the chemical and its by-products into the Los Angeles sewer system. From there, DDT made its way into the ocean food chain.

My graduate student, Cyndi Toone, and I speculated that DDT might be affecting western gulls. Researchers had already discovered that the pesticide causes eggshell thinning in cormorants, pelicans, and peregrine falcons, but its effect on gull eggshells was slight. We knew, however, that in one of its chemical forms, DDT mimics the sex hormone estrogen. Other studies had shown that when embryonic male gulls are exposed to estrogen, their reproductive tracts don't develop normally. The male chicks are chemically sterilized and unable to breed.

Given the unusually large number of supernormal clutches in the Santa Barbara colony, the fact that 95 percent of the nonbreeding birds at the site were females, and the high level of DDT in the gulls' environment, we wondered whether DDT was having estrogenlike effects on embryonic gulls in the Santa Barbara colony.

To test our hypothesis, we collected eggs from other gull colonies in California, in places where the birds were not exposed to DDT. We injected these eggs with DDT compounds or a control substance, and followed their development. We found that DDT does, in fact, cause the reproductive tracts of embryonic male western gulls to develop abnormally.

DDT was banned in the United States in the early 1970s, largely because environmentalists focused attention on the plight of brown pelicans and peregrine falcons, both of which were placed on the endangered species list. But an entire generation of western gulls was also affected. Before DDT started to affect the colony, 3,000 gulls bred on Santa Barbara Island. As males were chemically sterilized and failed to join the breeding colony, the number dropped to only 850 birds in 1978—coincidentally, the year the colony had its largest number of supernormal clutches.

This story has a happy ending, however. DDT levels in the ocean declined after the ban, and so did DDT levels in western gull eggs. By the late 1970s and early 1980s, the contamination level was so low that most male embryos developed normally, and these birds have since grown up and returned to the colony to breed. The National Park Service has continued to monitor the colonies, and the number of supernormal clutches on Santa Barbara Island is now much lower than it was in the early 1970s.

When female gull pairs were discovered, the phenomenon seemed to be just one more example of an unusual reproductive strategy. As it turned out, female pairs were a symptom of a serious environmental problem. The story of the western gulls on Santa Barbara Island is one case where scientists are glad to see less of an interesting behavior, not more.

JEFF FOOTT

It will take two parents to keep this western gull chick warm and fed. When male partners are in short supply, female pairing is a way to meet the demands of parenting.

Michael Fry is a research physiologist in the department of avian science at the University of California, Davis.

ANTARCTICA

Antarctica is home to millions of penguins, such as these Adelies. The continued well-being of the penguins and other Antarctic wildlife depends on how well we preserve the area's fragile ecosystem.

An Uncertain Future for the Land of Penguins

by Michelle Alten

Photographs by Wolfgang Kaehler

Near Antarctica's Ross Sea, katabatic winds rip across an ice-covered beach, dropping the temperature to minus 60 degrees Fahrenheit. Emperor penguins huddle together in the blizzard to protect themselves from the cold while incubating eggs on their feet.

Each year millions of penguins return to breed on the shores of Antarctica and its surrounding islands, along with a multitude of other birds, including 24 petrel species, terns, cormorants, skuas, pintails, and pipits. They are joined by crabeater, elephant, Weddell, and other seals. And 12 species of whales and dolphins feed in the region's fertile waters.

On a recent trip to the southernmost continent, I discovered that Antarctica is a unique sanctuary for seabirds and other wildlife. But like most of the world's refuges, Antarctica is a vulnerable ecosystem. Pollution, a hole in the ozone layer, and other environmental problems threaten this wilderness.

In 1991, members of the Antarctic Treaty—the nations that govern Antarctica—established a Protocol on Environmental Protection for the region. The birth of the environmental protocol came only after a long international debate concerning the future of Antarctica. When a framework for development and mining in Antarctica was put on the negotiating table, environmentalists protested that these activities could have a devastating effect on the Antarctic environment. One by one, treaty nations joined environmental groups in demanding that mining be prohibited in Antarctica. The movement led to a 50-year ban on mining and a draft of the new protocol. But the protocol is merely a first step. Other measures must be undertaken to protect the continent and its wildlife.

Antarctica's birds and seals compete with humans for the mere 2 percent of the continent that is not permanently covered by ice and snow. The mild climate and ice-free shores of the Antarctic Peninsula attract not only breeding wildlife, but also scientific bases. Thirty-eight operating research stations in Antarctica are the continent's chief polluters. The carelessness of the people who run the stations has often affected the well-being of Antarctic wildlife. Chile and the former Soviet Union built bases on the Fildes Peninsula at a site designated as a "specially protected area." At the Dumont d'Urville station, the French blasted a landing strip, killing penguins and dividing a colony in two. America's McMurdo Station, the largest base in Antarctica, was accused of operating a dump, conducting open-pit burning, and pouring raw sewage into the sea. Some environmentalists also believe that PCBs found in wildlife at nearby Cape Royds are a result of pollution at McMurdo.

On my journey by cruise ship, I boarded motorized rubber boats to visit beaches in the Antarctic Peninsula region. One day I watched chinstrap penguins swim to the shore of Deception Island. After spending the winter at sea, they were rejoining their mates and building their pebble nests. From time to time a penguin would scramble down a stony hillside and head out to sea to feed. Along the beach were rusty old drums and the collapsing remains of warehouses—the vestiges of a British research base, left behind when the volcanic island erupted in 1969. As with numer-

Antarctica provides sanctuary for numerous bird species and marine mammals such as the leopard seal, above left. But it is a vulnerable ecosystem, where humans have already left their mark—at right, the debris left behind at an abandoned scientific base.

ous other abandoned stations in Antarctica, no one has returned to clean up the waste. The debris left behind includes leaking fuel barrels—not only an eyesore, but a hazard to wildlife.

The Antarctic Treaty, signed in 1959, placed a hold on territorial claims, prohibited military activity in the region, and paved the way for scientific research and international cooperation in Antarctica. Agreements and conventions added to the treaty have sought to protect the region's wildlife and the environment. But until now, treaty nations have had only limited success controlling the destruction caused by scientific stations.

In recent years, concern over the environmental impact of research stations and their effect on Antarctica's wildlife has grown. Today the environmental protocol, agreed to by all the treaty nations but yet to be ratified, shows a new awareness of Antarctica's environmental problems. In addition to prohibiting mining in Antarctica, the protocol deals with marine pollution, waste management, environmental impact assessment, and the protection of flora and fauna. It establishes a new advisory committee for environmental protection, tackles the obstacle of international cooperation, and ensures the monitoring and inspection of research stations.

Jack Talmadge of the National Science Foundation (NSF) feels that the protocol is a positive step, but that it is too early to know exactly what effect it will have. "Operating parties in Antarctica are still discussing how the protocol will be implemented," Talmadge says. "Many countries are working to ensure that those active in Antarctica understand the requirements of the protocol. This season we should see how the protocol has impacted what is actually happening there."

Although the protocol is not yet in full swing, public awareness of Antarctica's environmental problems and threats to the region's birds and other wildlife have led to changes. Research stations have begun to alter their practices. During the last austral summer, NSF embarked on a major clean-up of McMurdo Station. The dump was removed, and approximately 200,000 tons of debris were shipped out.

Nongovernmental organizations have drawn attention to the problems that the French airstrip at Point Geologie causes for breeding penguins. In 1991, four environmental groups met with government officials to discuss actions that should be taken to help the birds and the environment. France accepted their recommendations. But while strides have been made, many nations are dragging their feet in the race to save the continent and its wildlife. Japan continues to whale in Antarctic waters in the name of scientific research. Other countries still gather penguin eggs to sell to zoos.

As our ship sailed past tabular icebergs, I spotted flocks of shearwaters and petrels feasting on squid and krill near the surface of the water. Occasionally one would plunge into the steel-blue sea, diving for its food. The rich waters off Antarctica provide food for most of the region's wildlife. Krill, small shrimplike creatures on which most penguins, seabirds, seals, and whales feed, are the keystone of Antarctica's complex food chain.

Oil spills are a major threat to Antarctica's wildlife. While the recent ban on mining has made an ecological catastrophe like the *Exxon Valdez* oil spill less likely, accidents are still a concern. In 1989 the *Bahia Paraíso,* an Argentine supply ship that also carried tourists, ran aground off the Antarctic Peninsula. The wreck caused a "minor" spill, leaking over 170,000 gallons of oil, and was reported to have killed over 30,000 seabirds and countless krill. With more and more scientific research vessels and cruise ships traveling to Antarctica each year, environmentalists fear that such shipwrecks may become more common.

But oil spills are not the only threat to the food supply of Antarctic wildlife. Each year Japanese and Russian commercial vessels fish for krill in Antarctic waters—a practice that may have a negative impact on bird and marine mammal populations. The most serious threat to Antarctica's food chain, however, may be the hole in the Earth's ozone layer that has opened up over the continent. Ultraviolet radiation emitted through the hole may be endangering phytoplankton—microscopic plants—on which krill feed. Recent studies by Raymond Smith and Barbara Prezelin of the University of California at Santa Barbara have found that UV-B light reduced the production of plankton by 6 to 12 percent. They also found that UV-B affected some types of phytoplankton more than others. How changes in the production of plankton will actually affect birds

THE ECOCOMPATIBLE TOURIST

The Zodiac crunches loose rocks on the shore as we nudge into the landing, and I step out into clear, icy water that comes up to my calves—well protected with knee-high rubber boots. Ahead are the slopes of Couverville Island and the raucous braying of nesting gentoo penguins. One of the few landing sites in Antarctica where three species of penguins nest, Couverville is a popular spot for visitors to this pristine, stark, and beautiful place.

The impact of achieving my wish to see wildlife in this most isolated place, by itself, is not great. As I walk on walnut-sized gray rocks across the beach, my footprints don't show. No plants grow here, so I'm not trampling anything. I'll observe the rule of staying at least 15 feet from the nearest penguin, and be content to sit and observe as gentoo penguins go about their lives in the rookery, sitting on eggs or protecting small, fluffy gray chicks nestled between their pink toes.

I sit on a guano-free rock and wait. A curious young chinstrap penguin waddles up for a closer look. I don't look like a penguin enemy—leopard seal or killer whale—so I'm observed with a cock of the head from side to side, maybe to see if both views coincide. We look at each other, penguin and parka-clad person, and I wonder how many other people that penguin has seen today. In January 1989, we were among about 3,000 tourists to visit Antarctica during the short summer season, and most visitors landed at the same places: a few wide, rocky beaches.

Antarctic visitors are classified as ecotourists—travelers with a purpose that focuses on the natural surroundings. Ecotourism is a relatively new word. Experts at Random House's dictionary department don't have the word in their references yet, so they estimate that the term has only been in wide use for a year or two at best. It's part of a new outbreak of "eco" terms that illustrate our current interest in things environmental.

But when we travel to other parts of the world to observe birds and other wildlife, are we doing harm, or good? The answer is yes, to both parts of the question. Natural areas are fragile, and too many feet landing on the same spot can damage the surroundings we've come to see. On the other hand, tourist dollars can help the financial situation in underdeveloped countries and encourage these countries to protect sensitive areas and threatened wildlife.

There's no doubt that many are jumping on the "eco" bandwagon, according to Mike McHugh, owner of MotMot Nature Tours, who's been operating birding tours for 17 years. " Add a naturalist to your payroll," says McHugh, "and you can advertise last year's tour as this year's nature tour." But McHugh's tours are the real thing: small, 8 to 15 participants with one expert guide and one local bilingual guide as needed. Birders on his trips appreciate the concentration on a small area and the time to really observe bird behavior. Half a dozen or so tour operators offer this kind of birding trip; it's a small part of ecotourism but very rewarding to the participants.

Visiting Antarctica is a special case of ecotourism, and one open to problems. You can't get there except by ship, which serves as your hotel while you cruise among icebergs. Our group of 126 on the *Illiria* were lectured on how to behave when we landed so we would not disturb nesting penguins during their short breeding season—but the group was large, and most passengers made the landings.

The Antarctic Traveler's Code for Visitors and Tour Companies, developed in 1989, tells visitors not to violate the personal space of seals, penguins, and seabirds, not to leave behind garbage, not to take souvenirs, not to interfere with protected areas or scientific research projects, and not to leave any footprints on mosses or lichens. The rules are simple to follow, but inevitably, as tour groups land at the same spots over and over, some disturbance will result. Cruise ships, especially the new ones with 300 to 400 passengers, make the problems worse.

Can any site in Antarctica stand more than 100 visitors a day in the summer without some detrimental effect? The best-equipped new tour ships do have refrigerated storage for garbage, on-board sewage treatment, and recycling programs to avoid contaminating Antarctic water and land. Visitors follow the traveler's code voluntarily, however, and no authority limits the number of people who can travel to Antarctica. Only weather and tour ship schedules restrict where people go and how long they stay.

Other beautiful, wild places—in South America, in Africa, around the globe—are, like Antarctica,

Thousands of ecotourists come to Antarctica each year to see the splendid vistas and wildlife. Above, a group from a cruise ship rides a Zodiac ashore to get a closer look at some gentoo penguins. Can Antarctica handle so many visitors? Only if tour companies obey sensible rules to minimize the impact of their presence. Far left, a molting Adelie penguin chick on the Antarctic Peninsula.

SPECIAL PULLOUT SECTION

BIRDSCOPE

The newsletter of the Cornell Laboratory of Ornithology ■ Volume 7, Number 1 ■ Winter 1993

The Sonic Solution for LNS

Greg Budney

A unique digital sound-editing system comes to the Library of Natural Sounds

Hollywood glitz is the last thing most people associate with field work in ornithology. But the same technological advances that permit ever more dazzling special effects on screen are benefiting the ornithological community as well. A case in point is the latest acquisition by the Lab's Library of Natural Sounds (LNS)—a computer-based digital editing system called the Sonic Solutions Sonic System.

LNS is the first natural sound archive in the world to acquire this advanced technology. Developed by some of the techno-wizards who worked miracles for Lucasfilms, the new Sonic System makes traditional (and time-consuming) tape editing obsolete.

The system is designed to operate with a Macintosh computer and includes two 1.6-gigabyte hard drives, an analog-to-digital converter, fiber-optic converters, a compact disk writer, and specialized software. The $75,000 system makes it possible to convert analog (tape) recordings to digital computer files, then manipulate the files to assemble a master recording. Because the tedious process of cutting and splicing has been converted to computer key strokes, a master can be assembled with relative ease and great speed. More than four hours of recordings—a remarkable amount—can be stored and manipulated with the digital editor.

The most revolutionary component of

TIM GALLAGHER

LNS sound engineer Bob Grotke demonstrates the new sonic system, which can produce compact disks in-house.

Stop in for a visit—we'd like to meet you

Ithaca, New York, is laughingly referred to as "centrally isolated." It's on the road to nowhere, but it's worth visiting if nowhere is your destination.

Here in Ithaca, the Lab's doors are open to all visitors, and there's a lot to see: the bird feeding garden, Sapsucker Woods Pond, the birding trails, the unsurpassed collection of bird art by Louis Agassiz Fuertes, the Crow's Nest Birding Shop. But most of the action takes place behind closed doors: bird song recording, bioacoustics research, bird monitoring and conservation studies, and education.

In the months and years ahead, the Lab will be opening its closed doors for visitors and the show will go on the road.

For starters, last June we swung the doors wide and rolled out the computers, recorders, tapes, data banks, and staff for a revealing day of hands-on demonstrations. In October 1991, the Lab went on the road and hosted "An Evening with Roger Tory Peterson" in New York City. In March, we hosted an evening of activities in Wilmington, Delaware. And most recently, we sponsored a day of Lab-related activities in San Francisco, including "An Evening with Paul Ehrlich." In the future we'll be on the road in other metropolitan areas; Chicago and Boston are next.

Stay tuned for Lab activities in your area. We are anxious to meet you and open our doors for your inspection and enjoyment.

And, don't forget to plan a birding trip to nowhere!

Scott Sutcliffe

Scott Sutcliffe, General Director

the system is the compact disk writer, a device that allows LNS technicians to record sounds directly onto blank compact disks. LNS will use the new disk writer to produce masters for its commercial tape productions and to produce custom CDs. Many people who use the LNS collection request customized recordings—for museum exhibits, to train field census workers, and for other applications. The compact disk writer can generate custom recordings far more quickly and conveniently than a tape production. And compared to tapes, CD recordings are much easier to use—instead of shuttling back and forth on a cassette to locate sounds, a user can access each sound almost instantly through the CD's standard indexing system.

LNS purchased the system with a four-year loan from Cornell University. LNS will cover the cost of the system with increased production of commercial tapes and through its regular user services. Requests for custom tapes by field workers have increased dramatically over the past two years.

In sum, the Sonic Solutions Sonic System is a quantum leap for LNS. The library's regular activities—publishing field guides and radio programs, producing recordings for research use, and all routine operations—will be greatly streamlined, and equally important, the cost of each of these operations will be minimized. Furthermore, LNS will be able to offer researchers who are surveying and censusing wildlife populations the advanced technology of CDs in a very affordable form. And the system opens new horizons as well; LNS is investigating the possibility of multimedia productions such as CD-ROM and CD-I. For LNS, the Sonic Solution is truly a revolution.

Other News from LNS

A single Spix's macaw remains in the wild, and extinction for the species seems certain. But the voice of the Spix's will not be lost to future generations. Recently, Lab associate Bret Whitney made a recording of the Brazilian bird, and a copy of the tape has been added to the LNS collection. It is the first Spix's macaw recording for the collection, and regrettably, probably the last.

BPS Conducts Pilot Study for Tanager Project

Pixie Senesac

On the days it didn't rain this past spring and summer in central New York, Bird Population Studies (BPS) researchers took to the woods to observe scarlet tanagers. The pilot study we conducted will enable us to fine-tune research methods for a new, nationwide study called "Project Tanager." This project is being funded by the National Science Foundation and the National Fish and Wildlife Foundation as part of the Partners in Flight Neotropical Migratory Bird Conservation Program. Matching grants have been supplied by Exxon Corporation, the Johnson Foundation, the Nelson B. Delavan Foundation, the Wallace Genetic Foundation, and FMC Corporation.

The tanager study will enlist volunteers to explore the effects of forest fragmentation on the four species of tanagers that breed in the contiguous United States. Breeding Bird Survey data show that scarlet tanager populations have diminished over the past 10 years. Forest fragmentation may be a contributing factor, and "Project Tanager" is designed to test this hypothesis.

DIANE TESSAGLIA

To track tanagers, multiple observers are essential.

We began the pilot study in early spring when male scarlet tanagers were defending territories and attracting mates. We chose forest study plots of three sizes—10, 100, and 1,000 hectares—and carried out 33 censuses in 13 different forests. At each census point, we spent 10 minutes listening for and counting singing males.

To make sure we hadn't missed any males, we played a recording of scarlet tanager calls and songs at the end of each count period. In eight out of 12 cases where we'd heard no tanagers during the count period, males appeared in response to the tape. Many of these flew in silently, which made us realize that multiple observers with eyes raised skyward will be an important part of the research design.

Later in the breeding cycle—and in between the rains—we returned to the plots to try to confirm breeding. The experience again pointed out the importance of multiple observers, especially when our quarry was a greenish female in the treetops.

Our final data set included more "probable" and "possible" than "confirmed" breeding attempts. We were surprised to find groups of three or four nonterritorial males, some already molting in mid-July.

Now we're evaluating our field experiences and refining the research methods for the nationwide tanager survey. We've decided to add a smaller plot size, and we're working on a training tape to introduce volunteers to the songs and calls of the tanagers. In addition, we plan to produce a tanager identification poster and other education aids for the folks who will take part in the project next year.

Next spring "Project Tanager" participants will be studying not only scarlet but also summer, western, and hepatic tanagers. Bird clubs, environmental organizations, and individuals who would like to be a part of the project are invited to contact the Lab now for more information. The data you collect could help us find out why these neotropical migrants are declining in numbers.

Those of us in BPS who got out in the woods for this year's pilot project agree that the experience provided scientific challenge and personal enjoyment. Tanager watching is a great way to spend spring and summer days—even in the rain.

For more information, please contact

Margaret Barker
Education Outreach Coordinator
Cornell Lab of Ornithology
159 Sapsucker Woods Road
Ithaca, New York 14850
(607) 254-2427

AROUND THE LAB

Conferences Attended

BPS director **Greg Butcher** attended the meeting of the American Ornithologists' Union, held July 24-28 in Ames, Iowa. Butcher presented a paper titled "Reproductive Success of Agricultural Birds During and After the DDT Era."

Three Lab staff members—**Greg Butcher**, EIS director **Rick Bonney**, and LNS curator **Greg Budney**—attended the National Training Workshop on Status and Management of Neotropical Migratory Bird Species, held September 15-21 in Estes Park, Colorado. The workshop was a part of "Partners in Flight—Aves de las Americas," a cooperative initiative for the conservation of neotropical migrants. At the workshop, Butcher chaired a panel, "Monitoring Goals and Programs of Different Organizations" and Bonney chaired a meeting of the Information and Education Working Group. Budney gave a talk titled "Magic Wands, Big Ears, and Compact Discs: Audio Equipment for Field Use" and demonstrated how compact disks can be used in field surveys.

Charles Walcott, the Lab's executive director, presented "Speculations on Avian Maps" at the International Congress of Neuroethology, held August 10, 1992, in Montreal.

In June 1992, Bioacoustics Research Program director **Christopher Clark** attended the International Whaling Commission Scientific Meeting in Glasgow, Scotland. The meeting focused on the growing schism between the scientific community, which collects data on several species of whales, and nations that want to resume commercial whaling.

Bioacoustics Grants Received

A $1.15 million grant has been awarded to BRP director **Christopher Clark** to monitor whale behavior in connection with the Acoustic Tomography-Ocean Climate project (ATOC). Clark's collaborator is Thomas Park, an electrical engineering professor at Cornell University. ATOC, an initiative to assess the rate and degree of global warming worldwide by measuring ocean temperatures, is funded by the Defense Advanced Research Projects Agency (DARPA).

Oceanographers from the Scripps Institute in San Diego plan to measure ocean temperatures by generating very loud sounds underwater and measuring how fast they travel across ocean basins. Temperature affects the speed at which sound travels through water. The powerful sounds from ATOC, however, could disrupt the behavior of whales, which use loud, low-frequency sounds to communicate over long distances. All whales are protected under the Marine Mammals Act and the Environmental Protection Act. Clark plans to monitor whales in the presence and absence of the ATOC sounds from field sites in Hawaii and California, using hydrophone arrays and techniques for tracking sounds in the open ocean.

Clark has also been awarded an $87,000 grant from the Office of Naval Research to develop satellite telemetry for whales. Clark's collaborators in this project are Christopher Heegard from Cornell University and Bruce Mate from Oregon State University. Whales will be fitted with radio transmitters that will relay signals to the researchers via satellite; the transmitters will be capable of picking up and broadcasting the animals' heartbeat rates and call rates as well as ambient ocean noise.

BRP has received three additional grants this past year. A $10,550 grant from an NSF program to promote cooperative research between the United States and Western Europe will fund travel related to Clark's ongoing work using microphone arrays to study avian acoustic communication. Project collaborators are researchers Torben Dabelsteen from Denmark and Peter McGregor from Great Britain. A second NSF grant from the Biological Instrumentation and Instrument Development program will fund continued development of Canary, BRP's novel sound analysis software package. Clark has also been awarded NSF supplemental grants totalling $21,000 to support research experiences for five undergraduate students.

Field Work

During the Bowhead Whale Acoustic Census, researchers count the endangered whales by listening for their sounds as they migrate past Point Barrow, Alaska. This past May, **Christopher Clark** was team leader for the fifth such census since he launched the project for the North Slope Borough of Alaska in 1984. BRP graduate student **John Bower** headed the acoustic team, while programmer **Steve Mitchell** provided technical programming support.

This year high winds piled ice on shore, preventing the team from recording for 20 days; because so little data could be collected, the census will be repeated next year. The expedition wasn't a total loss, however: Clark reports that before ice-up the team snared some exceptional recordings, and also made a landmark observation—for the first time ever, they were able to observe a whale while it was singing.

Courses Taught

This past fall, **Charles Walcott** took the lead in the team-taught Biology 221, "Introduction to Behavior." Over 400 students enrolled in this popular course.

The Library of Natural Sounds Field Recording Workshop enrolled 19 participants last June, a record number for the week-long course. LNS curator **Greg Budney** taught the course, assisted by sound engineer **Bob Grotke**, technician **Steve Pantle**, former Lab board member **Randy Little**, and Lab associate **Dave Herr**, who works for the U. S. Forest Service.

Productions

The Lab thanks State Farm Insurance Company for its generosity in funding our radio program, "BirdWatch." The show airs weekdays on 70 public and 54 commercial radio stations in 36 states, reaching 3 million listeners each week. To find out which radio stations in your area carry BirdWatch, send an SASE to BirdWatch, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850.

"Migrant Birds: A Troubled Future?," a slide show about the threats to neotropical migrants and the activities of Partners in Flight, is a useful resource for bird clubs and other environmental groups. Nancy Sandburg of the U.S. Forest Service and the Lab's **Rick Bonney** developed the 60-slide show, which comes with a cassette narration that automatically advances the slides as well as a written script. Cost is $35 postage paid; write to Maureene Stangle, Education and Information Services, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850, or call (607) 254-2440.

The best-selling game "Play It By Ear" challenges listeners to identify a host of sounds, including over 100 animal sounds from the LNS collection. Rykodisc, the company that produces "Play It by Ear," sent LNS curator **Greg Budney** into the field to bag some new sounds for the second version of the game, released this past summer.

Arrivals and Departures

Education and Information Services (EIS) welcomes **Margaret Barker** to the newly created position of education outreach coordinator. She has taken over coordination of Project FeederWatch as well as the new National Science Experiments, including Project Pigeonwatch and Project Tanager. Margaret has over 10 years of experience in broadcast journalism and holds an M.S. in environmental education from the National Audubon Expedition Institute.

Three Bioacoustics Research Program staffers are now pursuing doctoral degrees at Cornell and conducting research with a bioacoustics component. **John Bower** and **Laura Brown** are full-time students; **Steve Mitchell** continues to work for BRP half-time.

David L. Ross, Jr., the Lab associate who recently produced the audiocassette, "Voices of the Cloud Forest," has joined the LNS staff as a curatorial technician. The lifelong birder has a B.S. in wildlife biology from West Virginia University. He is presently working on a new tape production for LNS, "Voices of the Corcovado Rain Forest."

Project Aves Gets Grant; Launches Second Year of Classroom Bird Study

A Dwight D. Eisenhower grant awarded by the New York State Department of Education will fund continued development of Project Aves, an innovative, bird-oriented curriculum for elementary and middle schools. This coming year, 45 teachers in western New York will make Project Aves part of their classroom activities.

Project Aves, a collaboration between the Lab and the Roger Tory Peterson Institute (RTPI), brings hands-on science to school classrooms. The project was piloted during the 1991-92 school year, when 16 teachers in 10 schools across New York used the multidisciplinary curriculum in their third- through sixth-grade classrooms.

A key component of the pilot project was a feeder bird food preference study. Participating classes hung two identical feeders outside classroom windows—one filled with black-oil sunflower seed, the other filled with safflower seed—to see which one birds would visit most often. Safflower seed has only recently come into use as a backyard bird food, and even ornithologists don't really know which birds find it most attractive.

This fact has made Project Aves a true exploration, quite different from most "canned" school science experiments, which have predictable outcomes. Lab education specialist Todd Culver reports that when the students pooled their data at the end of the year, they discovered that 63 percent of all feeder visits were to the black-oil sunflower feeder. The overall figure hid some site-to-site variation, however. For example, students at Trumansburg Elementary School couldn't believe that any birds liked safflower seeds, as the chickadees visiting their feeders showed a 10-to-1 preference for sunflower seed. At the Temple Hill School in Newburgh, New York, on the other hand, purple finch was the most common feeder visitor, and this species showed a clear preference for safflower seed. And while some classrooms saw comparatively few birds, feeders at the Manorhaven school in Port Washington, New York, attracted swarms of sunflower-eating house finches—so many that it took three children per feeder to count them all.

Teachers and students alike were enthusiastic about the pilot year of Project Aves, and the Eisenhower grant allows the program to reach more teachers in New York State. To launch the second year of the project, Culver traveled to the State University of New York at Fredonia this past August to present Project Aves workshops for the 45 teachers from western New York who will use the curriculum in the coming academic year.

This time, in addition to studying food preferences, students will construct nest box trails on school grounds to attract cavity-nesting birds. Cornell ornithologists are interested in the data students will collect, which should shed light on both the link between weather and reproductive success in cavity nesters and geographic differences in these birds' breeding biology.

Meanwhile, Culver and RTPI director of education Bill Sharp are seeking additional funding for Project Aves, with the goal of mounting a national education initiative. A proposal to the National Science Foundation is in progress. Education staff at the Lab and RTPI point out that Project Aves not only teaches children about birds, but also helps them develop a strong commitment to environmental preservation.

Elephants Calling

by Katharine Payne

New York: Crown Publishers, Inc., 1992.
36 pages. Hard cover. $13.95.

ELEPHANTS CALLING

A few years ago, while studying captive elephants in a zoo, Lab bioacoustics researcher Katy Payne discovered that elephants "talk" to one another using infrasound—powerful, low-frequency sounds that are inaudible to the human ear.

She traveled to Kenya to study elephants in the wild. Out of that experience came significant scientific publications, and now, a magnificent children's book, *Elephants Calling.*

The first in the "Face to Face with Science" series by Crown Publishers, Inc., *Elephants Calling* is a carefully crafted account of elephant society. Payne focuses on a very young elephant named Raoul and his family as she relates the events of a single, eventful day. Striking color photographs by Payne and her colleagues complement the evocative and thoughtful text.

Recent Publications

Bonney, R. "Death of the dawn?" *Wild Earth* 2(1):57-60; 1992.

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*Lab staff in **bold** type.*

Birdscope, ISSN 1041-6676, is published in December, March, and June by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone (607) 254-BIRD. *Birdscope* is free to members of the Lab, a nonprofit, membership organization for the study, appreciation, and conservation of birds. For information on membership please write to our Membership Department. Copyright 1993, Cornell Laboratory of Ornithology.

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feeling the crush of visitors. But for some indigenous peoples, ecotourism has been an economic boon. The 10,000 tourists annually who glide silently in hot air balloons over the wildebeests, buffaloes, elephants, and lions of Kenya's Masai Mara contribute $25 each to the local tribal council, which hires wildlife experts to help manage the reserve's animals. Although it's difficult to separate the money spent on ecotourism from all other tourist spending, the World Travel and Tourism Council estimates that tourism generates more than 2.9 trillion dollars per year, more than 12 percent of all consumer spending. When travel takes us to underdeveloped countries, that tourism can have a significant economic impact.

Ecotourism can also spur species conservation. Education campaigns in Peru and on some Caribbean islands are teaching the indigenous peoples that the colorful parrots they hunt for food can instead be a money-making tourist attraction. The birds are worth more alive, so they're protected.

Natural phenomena—birds and other living things—will continue to draw us to isolated parts of the world. Responsible ecotourists will walk lightly on the land whenever they visit, and follow instructions so they don't disturb the birds and animals they've come to see. If ecotourists stay away, local residents will cut forests for firewood and hunt birds for dinner to meet their daily needs, or nations may sacrifice environmental quality for research or development opportunities, instead of preserving species and habitats for ecotourists to enjoy. I know I'm ready to go back to Antarctica.

—Jane E. Hardy

The remains of an old whaling station, above, are a silent reminder of how this once-pristine continent has been despoiled by humans. The new environmental protocol is a major step toward preserving Antarctica's unique habitats and wildlife. Above right, a nesting pair of wandering albatrosses.

and marine mammals higher up on the food chain has yet to be studied.

The international community has signed an agreement for the elimination of chlorofluorocarbons, the chemicals responsible for the thinning ozone layer, by the year 2000. But Bruce Manheim of the Environmental Defense Fund suggests, "It may take around 75 years for the ozone problem to go away in Antarctica, and by then it may already be too late."

Meanwhile Antarctica's natural spectacles attract more and more visitors each year. In the past, cruise ships traveling to the region were equipped with ice-hardened hulls, bow thrusters, and special navigational gear for polar travel. But today, large cruise ships, not designed for travel in pack ice, and a flurry of private yachts set sail for the southern continent. Changes in Antarctic tourism raise questions about its possible negative impact on the area's ecosystem. Uncharted waters and pack ice make navigation in Antarctica particularly difficult. Inexperienced captains and crews, as well as an increase in the numbers of vessels traveling to the region, are bound to make accidents and oil spills more likely.

Six cruise companies operating in Antarctica, aware of the potential impact of tourism on the environment and animal life, have formed the International Association of Antarctic Tour Operators (IAATO). They have set guidelines outlining how travelers and tour operators should conduct themselves in Antarctica, which they distribute to their passengers and staff. But despite the protocol and efforts by IAATO, there still are no limits on the number of people who can travel to Antarctica each year and no restrictions on where they can go or how long they can stay. Many people feel that much more needs to be done to control tourism in the area.

In recent years, population levels of some Antarctic birds have changed. Scientists are concerned about decreases in the numbers of albatrosses and giant petrels that breed on subantarctic islands, and giant petrels found on the Antarctic peninsula. David Ainley of Point Reyes Bird Observatory explains, "These decreases are due to the seabirds being hooked on long-line fishing gear. The long lines have hooks at intervals, and foraging birds that go for the bait get caught on the hooks."

Changes in penguin populations may be telling another story. Adelie penguin numbers are increasing in the interior pack ice of the Ross Sea. "This is only a hypothesis," says Ainley, "but these changes may be due to decreases in the amount of pack ice caused by global warming."

Antarctica and its wildlife may carry messages for us all about the future of the Earth. Studies of the Antarctic ozone hole and weather patterns may provide information relevant to life on the entire planet. But as the Antarctic environment continues to be defiled, valuable research and data are put at risk.

On Nelson Island I watched giant petrels huddle on their stone nests. At a nearby penguin colony, skuas snatched unguarded eggs while sheathbills feasted on the carcass of an elephant seal. The drama of Antarctica unfolded before me.

As I watched birds perform their breeding rituals, rear their young, and feed at sea, I wondered whether the new protocol and other environmental efforts would succeed in preserving this fragile ecosystem and protecting its wildlife. In the next few years we may learn not only about the destiny of Antarctica's wildlife, but about our own future as well. ■

Michelle Alten is a freelance writer who specializes in travel, art, and environmental issues. Wolfgang Kaehler is an internationally renowned photographer who has traveled to Antarctica 16 times.

For more information on Antarctica, contact the following organizations:

The Antarctica Project, 707 D Street, SE, Washington, DC 20003. (202) 544-0236

The Cousteau Society, 870 Greenbrier Circle, Suite 402, Chesapeake, VA 23320. (804) 523-9335

Environmental Defense Fund, 257 Park Avenue, S, New York, NY 10010. (212) 505-2100

Greenpeace, 1436 U Street, NW, Washington, DC 20009. (202) 462-1177

D. CAVAGNARO

Christmas Trees for the Birds

Who says that business and birdlife don't mix?

by Cathy Blumig

Len Wolgast strides past a row of small conifers, walking toward a line of snags that rims the distant edge of a field. Students from his wildlife conservation class follow. Along the way he stops before a bluebird nest box and flushes a house wren. When he comes to a Scotch pine marked with pale green flagging tape, he reaches in and gingerly bends back the branches to reveal a song sparrow nest with four brownish red eggs. At last the group reaches the snags. One, a girdled elm, is spattered with whitewash near the base of its trunk, indicating a raptor perch site.

This oasis in the heart of suburban New Jersey could be a private nature preserve. In fact, it's a working farm—a Christmas tree farm. The nation's 15,000 Christmas tree farms, says Wolgast, could provide habitat for a wealth of wildlife. It's a message he wants to spread.

Ninety-five percent of all Christmas trees are cut, not in forests, but on Christmas tree farms. The National Christmas Tree Growers Association estimates that one million acres are devoted to growing Christmas trees across the United States. Between wholesale growers, retailers, and choose-and-cut farms, the Christmas tree industry last year grossed 1.2 billion dollars.

MARIE READ

But at what expense to the environment? On the positive side, Christmas trees have less environmental impact than some crops. They don't deplete soil nutrients to the same extent as corn and cotton plants, they generally do not need routine doses of insecticides or fertilizer, and they are not especially "thirsty" plants. Furthermore, because young trees are efficient photosynthesizers, they help relieve the build-up of carbon dioxide in the atmosphere.

The down side is that the industry relies on monocultures, with a consequent loss of biological diversity. Many farmers apply herbicides so liberally to control weeds that they leave nothing but bare ground between the trees. And because each species of evergreen has its own disease and pest problems and its own growth pattern, most large scale growers streamline production by focusing on the needs of a single species of tree.

To rely on a simplified ecosystem that caters to one species is to risk ecological bankruptcy. For example, a 1963 study in the *Illinois Natural History Survey Bulletin* documented the change in bird populations in Illinois from 1909 to 1957. At the turn of the century, agricultural lands incorporated hedgerows and interspersed woodlands—excellent habitat for wildlife. But by 1957 the "clean" practices of monoculture had transformed much of the Illinois landscape into a biological wasteland. Bird populations—brown thrashers, orchard orioles, field sparrows, eastern kingbirds, and yellow-billed cuckoos—experienced massive reductions. Although the specific effects of Christmas tree monocultures on wildlife have not been studied systematically, many other studies have shown that in general monocultures obliterate habitat and reduce biodiversity.

On the other hand, Christmas trees are one crop that can—with proper management—meet the needs of a variety of wildlife species. Len Wolgast wants to show other tree farmers how to do it. In addition to operating his Christmas tree farm, he is also a wildlife professor at Cook College-Rutgers University in New Jersey. Using an array of management techniques, Wolgast has created a haven where birds can nest, hunt, forage, perch, and roost from the farm's mere 16 acres. More than 180 species have been sighted there since 1977. What's more, Wolgast makes his avian guests allies in an integrated pest management program.

Wolgast's farm is located in central New Jersey, in an area where fields and woodlands are being squeezed out by a spreading crust of office buildings, warehouses, and housing developments. From his kitchen window he can see a Union Carbide warehouse and hear the incessant din of traffic less than a mile away. Most of the farms and woodlots that surround his property have already been purchased by developers, but have been spared temporarily because of the inert economy.

When Wolgast began designing the Christmas tree farm that he had dreamed of since he was a college sophomore, he chose five species of conifer that were suited to his growing conditions:

Scotch pine, white pine, Norway spruce, Colorado blue spruce, and Douglas fir. To further diversify the fields, he interplanted the species in mixed stands and staggered the planting in a 10-year rotation. This design makes the farm a little less convenient to manage, but it helps prevent disease and pest infestations. Customers like the selection of trees, too.

Dotting the rows of evergreens are deciduous trees such as flowering dogwood, American elm, and black cherry. These produce mast—seeds and nuts—that birds relish. Wolgast's students got a graphic demonstration one autumn morning when a flock of cedar waxwings descended on a dogwood full of scarlet fruit and launched into a feeding frenzy. Other features of the farm that benefit birds, however, are more subtle.

CATHY BLUMIG

Birds prefer a mix of trees to a monoculture, so tree farmer Len Wolgast, above, plants five kinds of evergreens, as well as fruit and seed-bearing trees. Though maintaining the mixture is a lot of work, Wolgast gets a double payoff: customers like the variety, and so do songbirds such as the cedar waxwing at left.

Wolgast lets weeds grow between tree rows to provide cover for thousands of insects. He mows every six weeks, letting the vegetation grow tall enough to support a healthy insect population, but not so thick that the rows become impassable. This healthy prey base attracts insect-eating birds, including some resourceful purple martins and barn swallows. The roar of the mowers seems to beckon these birds, and they come swirling out to swoop and dive at the mower, snatching up the insects driven out by the rotating blades.

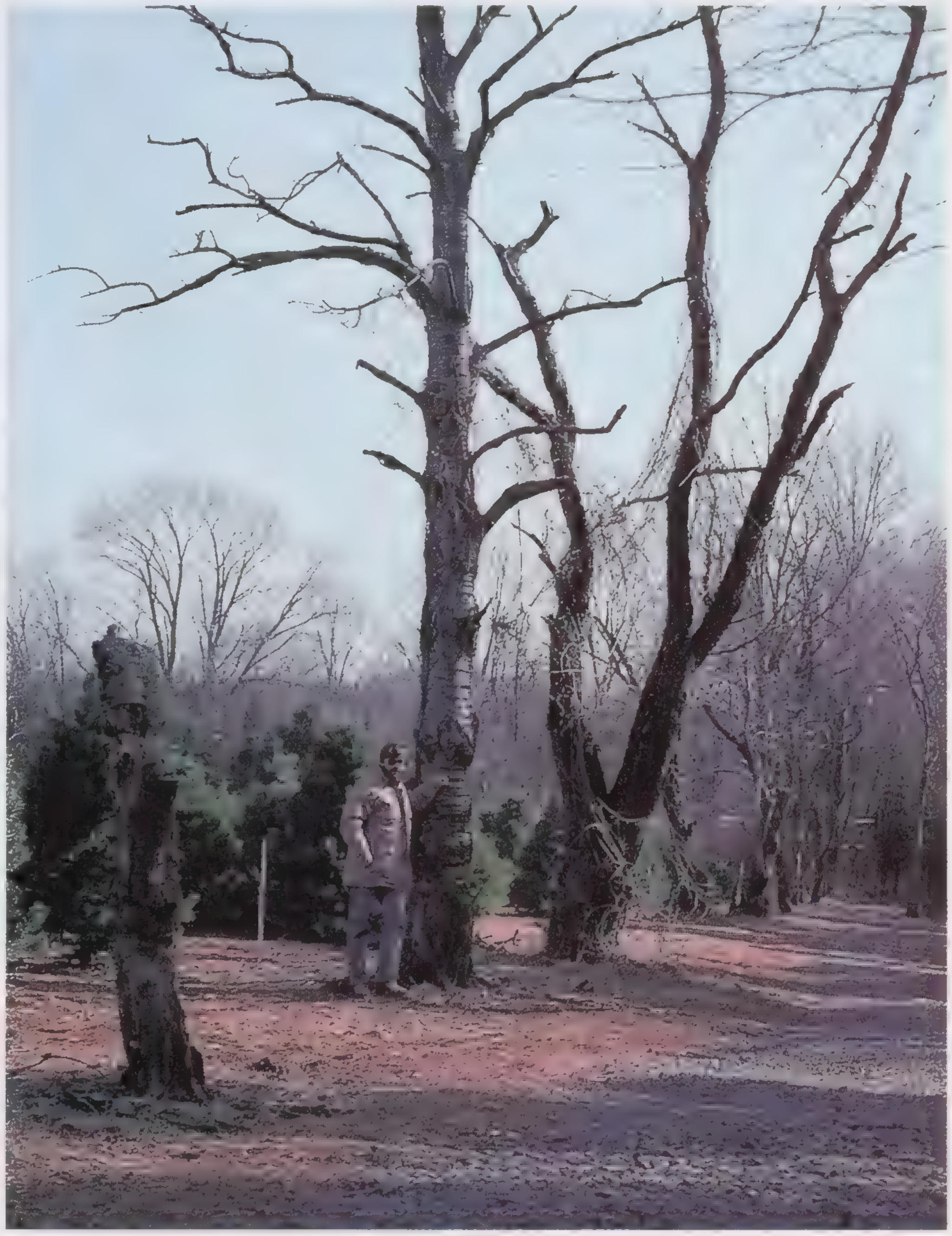
In late summer when the Christmas trees are no longer in their peak growing period, Wolgast cuts back on mowing to allow a surge of seed-producing plants such as foxtail and tickseed sunflower. Droves of mourning doves, sparrows, indigo buntings, and other species converge on the fields to dine on the seeds. A final mowing near the end of September clears the way for customers who tag a tree in autumn to reserve it for December.

During the winter months the Christmas trees offer resident birds good cover, food, and shelter from predators. "Feeder birds" such as dark-eyed juncos and white-throated sparrows forage between the rows. On rare occasions Wolgast has seen flocks of white-crowned sparrows and white-winged crossbills.

The farm is a home for small mammals too, primarily eastern cottontail rabbits and meadow voles. Wolgast has recruited some other tenants to keep these bark-chewers under control. He girdled a line of hardwoods that had been shading out some Christmas trees and left the dead trees in place along the edge of a field. Twelve species of raptors have since been spotted patrolling the fields, and the ground below the trees is splotched with a whitewash of droppings and owl pellets. Northern harriers and kestrels make seasonal visits, while nocturnal raptors such as great horned owls and eastern screech-owls are year-round residents—and the rabbit and vole populations are kept under control.

The snags serve other functions too. Insect-gleaners such as brown creepers, chickadees, and downy woodpeckers forage along the trunks, and cavity nesters such as northern flickers, tufted titmice, and house wrens nest in some of the hollows.

The bird-friendly management tactics extend to the hedgerows that surround the fields. These help to stabilize soil and create "edge," a valuable commodity to many forms of wildlife. They have a tiered appearance, combining vegetation that provides nesting cover, mast-producing trees, and fruit-bearing shrubs and vines. Running along the midline are the mast-bearing trees—red oak and white oak, American elm, chokecherry, and east-



CATHY BLUMIG (2)

Owl pellets, above, show that the "integrated pest management system" is working. Wolgast girdled a row of elms and left the dead trunks standing, right. Raptors use the snags as perch sites and also control populations of bark-gnawing rodents free of charge.

ern red cedar. American bittersweet, Virginia creeper, and fox grapevines ascend these trees like rigging on a sailing vessel and fall into tangles of multiflora rose, silky dogwood, elderberry, and varieties of viburnum and honeysuckle.

Birds nest at all levels within the hedge. Every summer northern orioles and orchard orioles take to the upper tiers, while white-eyed vireos and American goldfinches weave nests in the red maples and silky dogwoods. Common yellowthroats, gray catbirds, mockingbirds, brown thrashers, and cardinals prefer the tangle of shrubbery, and rufous-sided towhees nest on the ground beneath the thatchlike brush.

A small wetland boosts the farm's avian variety. Wolgast dammed a stream to create a woodland pond that attracts wood ducks, black ducks, mallards, Canada geese, and such wading birds as great blue herons and green-backed herons.

The working farm is also an educational tool. When university students and grammar school children visit, the farm becomes an outdoor laboratory. Students trap and ear-tag rabbits to estimate the prey base for raptors. One graduate student is studying the breeding ecology of songbirds that nest in Christmas trees. Forestry students learn that agroforestry can consider the needs of wildlife, and undergraduates pursue projects that involve nest box construction and wildlife plantings.

Wolgast's biggest educational task is speaking to the New Jersey Christmas Tree Growers Association. Although large wholesale growers aren't likely to adopt Wolgast's techniques, which require an attention to detail that many are reluctant or find difficult to implement, small choose-and-cut operations are often willing to try his methods. Sales of pre-cut Christmas trees are dropping, while the popularity of "cut your own" trees has risen. Such farms are usually managed for supplementary income; the owner generally lives on the farm and interacts directly with customers. Today, with public concern focused on environmental issues and with businesses flaunting their "green" side, customers may prefer to patronize those places that accommodate wildlife.

For Len Wolgast, farming to accommodate wildlife just seems like the right thing to do, and he hopes other farmers will join him. All that is needed, Wolgast says, is the desire to do something for wildlife and the knowledge of how to do it. ■

Cathy Blumig is a freelance writer and roving biologist who makes New Jersey her home base.

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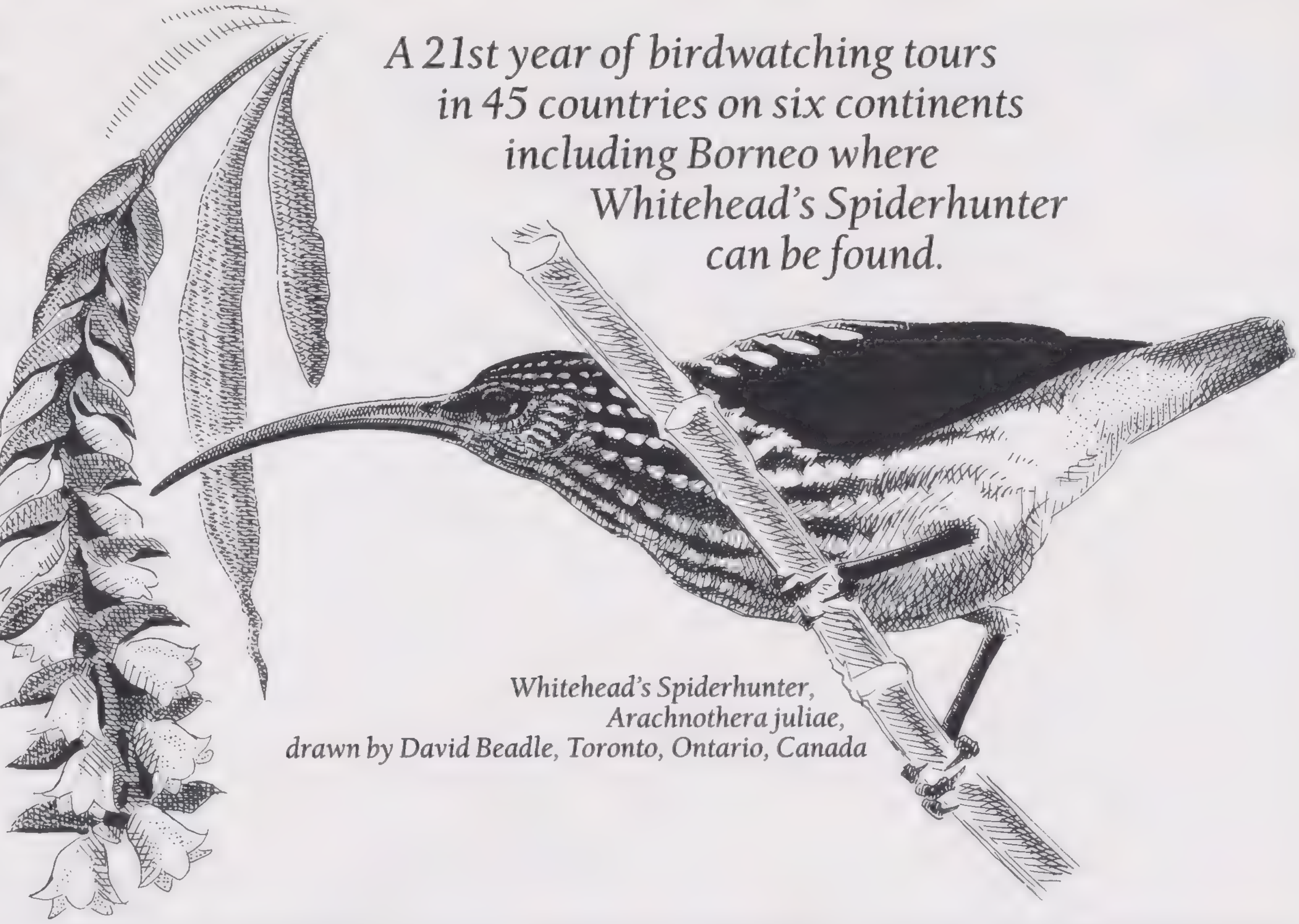

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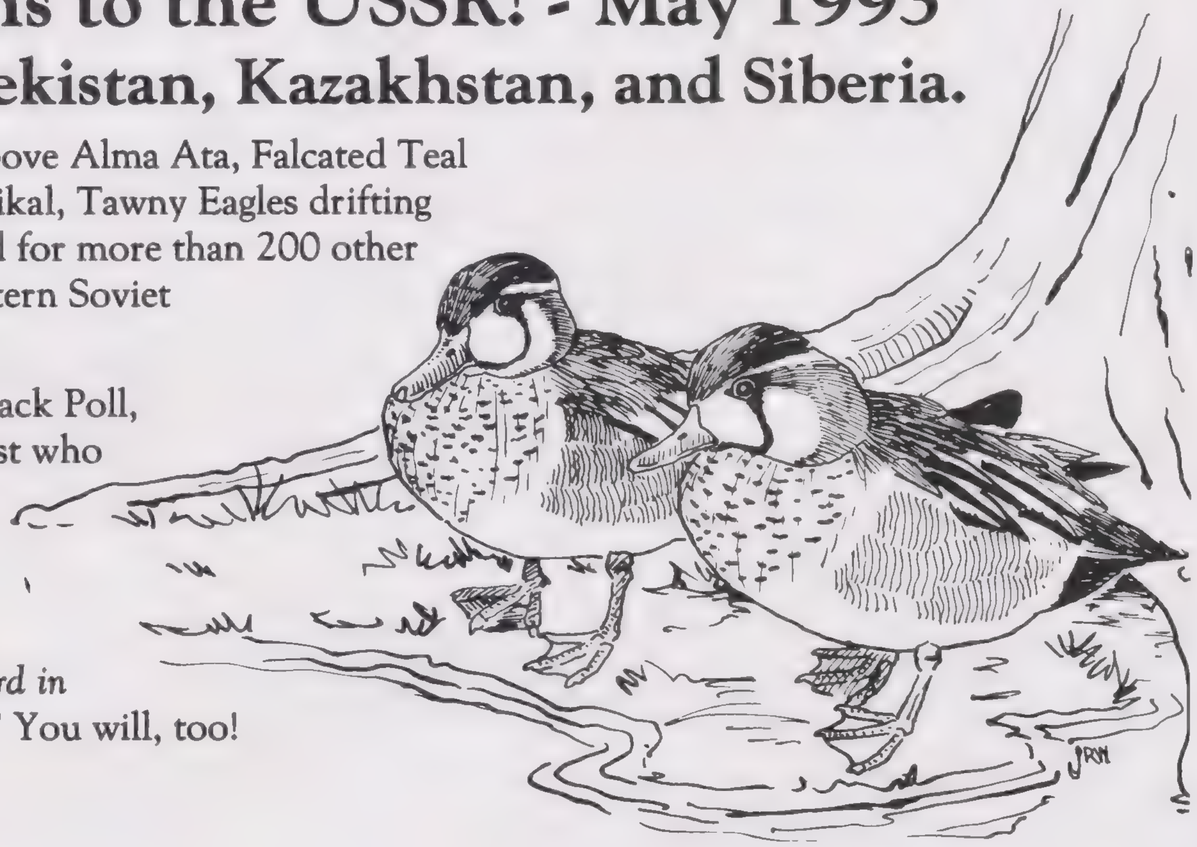

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On Being Systematic

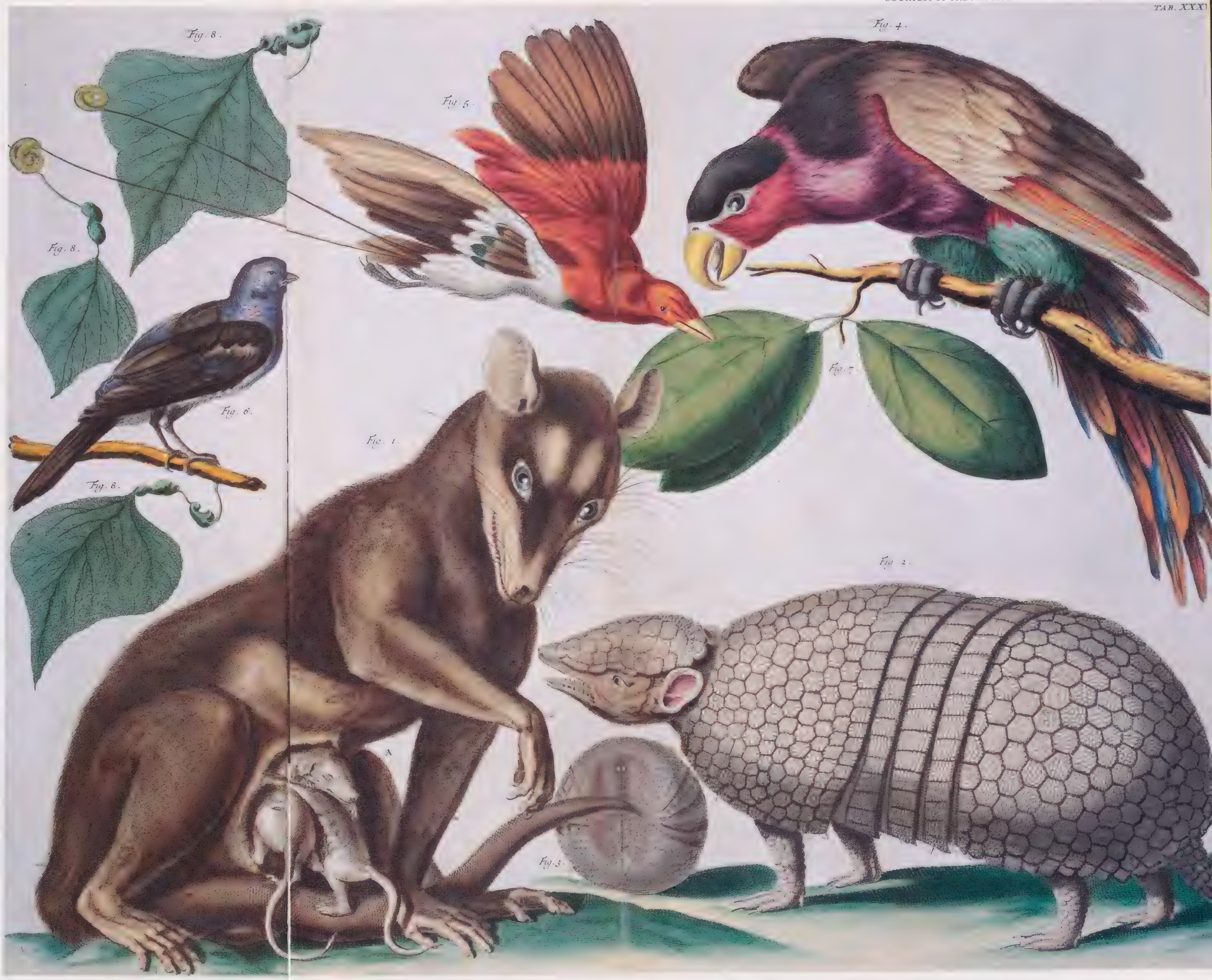
by Kevin McGowan

Avian taxonomy enters the age of molecular genetics

"How do they know all of these birds are in the same family?" I'm associate curator of the Cornell Vertebrate Collections, and I hear this question whenever I show a group of students the drawers of blackbirds in the ornithology collection. Why is it, someone always asks, that brightly colored orioles and meadowlarks are "blackbirds" (Icterinae), but soot-black starlings and crows are not? It's hard to answer satisfactorily. I generally say, "Well, even though they look very different on the outside, we know they are related because of similarities in their internal anatomy."

What the question really boils down to is this: how do people classify birds? From time immemorial, humans have been naming birds and trying to organize them in logical groups. The

COURTESY OF THE NATURAL HISTORY MUSEUM, LONDON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Humans have been organizing birds into groups for millenia; the criteria for classification, however, have changed over time. Aristotle grouped birds by habitat; 18th-century taxonomist Carolus Linnaeus grouped birds according to their physical characteristics. Today, researchers are able to examine each species' genetic code. The illustration above is by Albert Seba, a contemporary of Linnaeus who compiled his own Thesaurus *of living creatures.*

BHL

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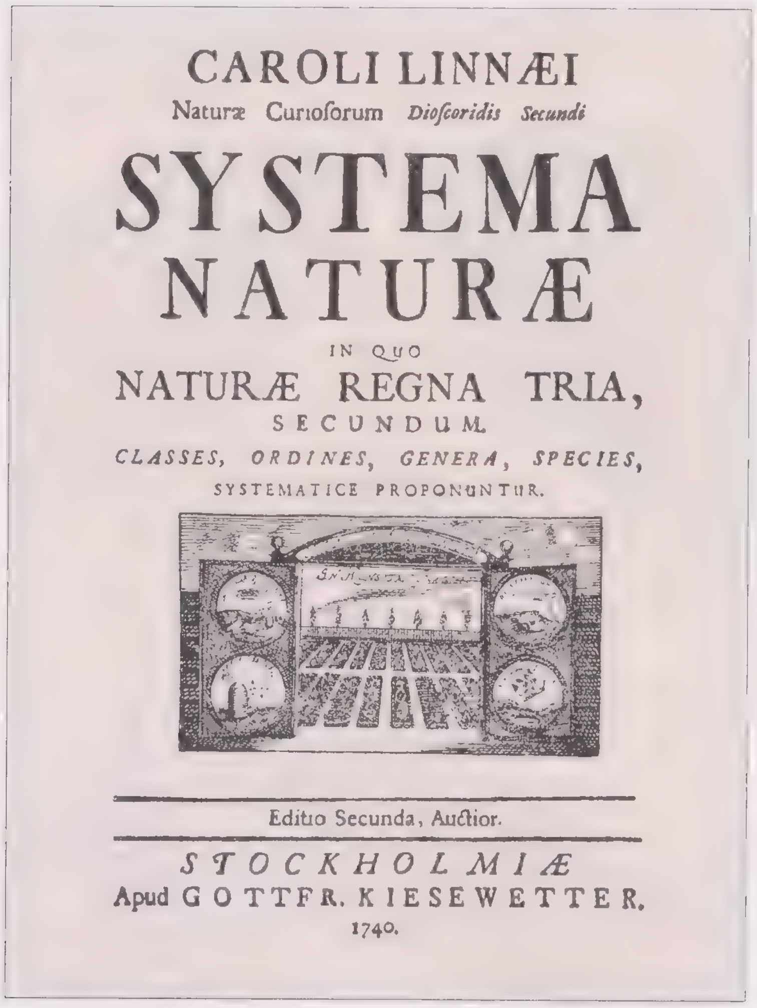
most recent effort, by former Cornell professor Charles Sibley (now at San Francisco State University) and Cornell graduate Jon Ahlquist (now a professor at Ohio University) uses state-of-the art techniques to look directly at a bird's genetic code. A brief review of the history of bird classification will put Sibley and Ahlquist's landmark accomplishment in context.

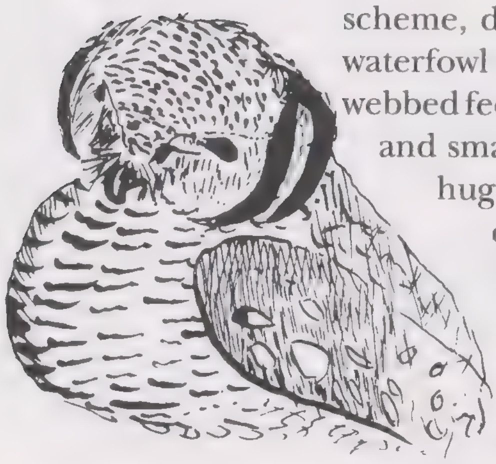
We love to put things in pigeonholes, whether or not they go in easily. How we arrange our categories depends on what we want them to represent. For example, in a primitive society, birds might be divided into two groups: edible and inedible. Aristotle, the first great biologist, classified birds according to habitat: land birds, water birds, and birds that lived at the edge of the water. Sixteenth-century French naturalist Pierre Belon expanded on Aristotle's classification scheme, dividing birds into six groups: raptors, waterfowl with webbed feet, marsh birds without webbed feet, terrestrial birds, large arboreal birds, and small arboreal birds. This system wasn't a huge improvement—it lumped ostriches, chickens, and larks together in the "terrestrial" category.



CAROLI LINNÆI
Naturæ Curiosorum *Dioscoridis Secundi*
SYSTEMA
NATURÆ
IN QUO
NATURÆ REGNA TRIA,
SECUNDUM
CLASSES, ORDINES, GENERA, SPECIES,
SYSTEMATICE PROPONUNTUR.

Editio Secunda, Auctior.

STOCKHOLMIÆ
Apud GOTTFR. KIESEWETTER.
1740.



In 1676, English naturalist John Ray and his pupil Francis Willughby were the first to use anatomical characters—visible, physical traits—as the basis of a classification system. Carolus Linnaeus used their work as one of his primary sources in his landmark classification of animals, the *Systema Naturae*, compiled in the mid-1700s. This work revolutionized the science of classification. Although many names and groupings have changed since his original work was written, the system itself has endured and is still in use today.

Each type of living creature is positioned within a hierarchy of groupings. Individuals of the same type are considered members of the same **species**—the basic unit of classification. Similar species are grouped together within the category of **genus**, similar genera within a **family**, similar families within an **order**, orders within a **class**, classes within a **phylum**, and phyla within a **kingdom**. Scientists around the world, whatever their native language, can all refer to the same species by its two-part "Latin" name: the genus (always capitalized) and the species (never capitalized).

Different systems of classification, based on similarities of habitat, behavior, or morphology, circulated in the scientific community for the next 100 years or so without any consensus being reached. Then in the 1860s Charles Darwin expounded his theory of evolution by natural selection. As a result, classifications based on some vague "natural" or "logical" order were replaced with systems that grouped organisms together because of their common ancestry. The questions of what characters to use and where to draw the boundaries in such a system have been, and continue to be, subjects of great debate.

The first modern evolutionary classifications of birds, based on a host of anatomical characters, were proposed by Maximillian Furbinger in 1888 and Hans Gadow in 1892. At last all the passerine songbirds were grouped together, while swifts were separated from swallows and cuckoos from woodpeckers. Subsequent bird classifications were based heavily on these two works, and few major changes were made in the first half of the twentieth century.

One modern taxonomist whose work is especially relevant to us, however, is Smithsonian researcher Alexander Wetmore. Although his classifications, published between 1930 and 1960, differed little from Gadow's, Wetmore did organize the songbirds, a group that Gadow viewed as uniform and left largely undifferentiated. Wetmore's publications are the basis for the ordering of groups found in most American field guides.

A few odd reorganizations have been proposed in recent decades, but none has gained much support in the ornithological community. In fact, inertia seems to have played a great part in maintaining the classification of birds throughout the past century. Unless strong evidence to the contrary has been available, bird relationships have stayed just where Gadow put them. Species get moved around regularly, some new families have emerged, others have been discarded, but very little movement of families between orders has taken place.

Meanwhile, however, great advances have been made in molecular biology. With the discovery of DNA—the "genetic code"—and with the elucidation of its structure and function, we have come to understand how information is passed from parent to offspring, and also how it is modified in the process of evolution. We know that an organism's visible traits are determined by the sequence of a mere four chemical bases in the DNA molecule. These bases are the "letters" and "words" in the instructions for constructing an organism.

One problem with a phylogeny based on anatomy is that it assumes visible, physical traits represent underlying genetic relationships. This may or may not be true, depending on the organisms in question. Consider webbed feet, for example. If we say two groups of birds are similar because both have webbed feet (ducks and gulls were grouped together this way until 1867), we are assuming that the genes—the DNA—responsible for webbed duck feet are the same as the genes responsible for webbed gull feet.

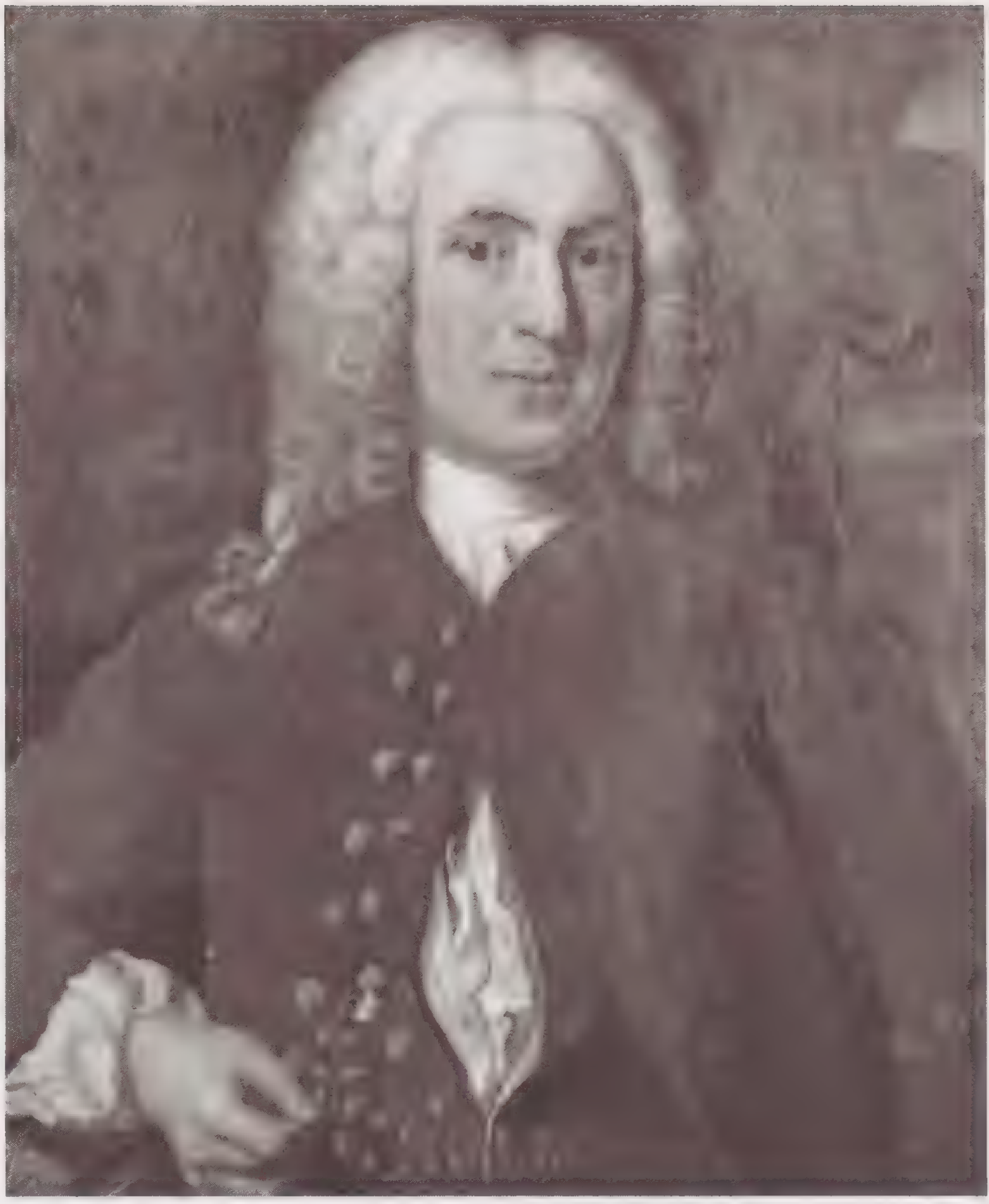
Such an assumption may or may not be valid. In the case of ducks and gulls, when taxonomists looked at other internal anatomical characters (the shape of bones in the palate, the shape of the nostrils, the presence or absence of feathers on the oil gland, the arrangement of feathers in the feather tracts, and the number of primaries on the wings) they concluded that gulls are more closely related to shorebirds, most of which have no foot webbing, and that ducks are more closely (though still distantly) related to gallinaceous (chickenlike) birds.

Scientists have concluded that the webbed feet of gulls and ducks are *independently* evolved adaptations to life around water, and that the genes that code for webbed feet are different in the two groups. This problem of mistaking convergence for actual relatedness has been a particularly vexing one for the last 100 years. If only, researchers yearned, we could look at the actual DNA that codes for the characters we can see.

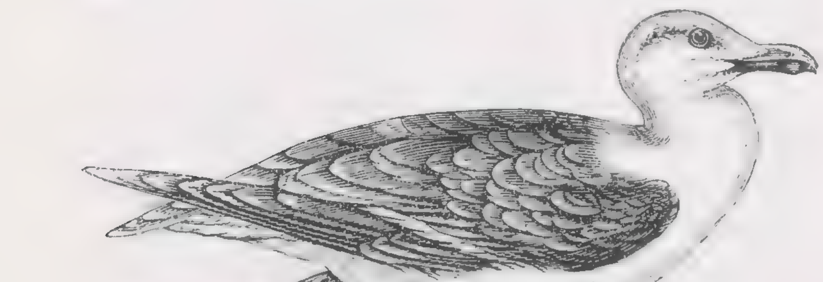
Finally we are able to do just that. An ever-increasing array of techniques permits us to look at the structure of DNA. And systematics, the study of relationships, is undergoing a renaissance as a result. Using molecular techniques, we can finally look directly at relationships that we have been trying to infer for a century.

Many different techniques have been developed to look at DNA, and each is useful on a different level of comparison. For example, the information needed to distinguish the most closely related two out of three chickadee species is different from the information needed to find which two out of three groups—say, ducks, hawks, and sparrows—are most closely related.

A particularly powerful technique for comparing groups is DNA-DNA hybridization. In this process, double-stranded molecules of purified DNA—which look like tiny, incredibly long, twisted zippers—are "unzipped." The molecules are broken apart along the midline, separating the millions of base-pair combinations that make up the genetic blueprints. Because DNA molecules are more stable double-stranded (zipped) than single-stranded (unzipped), the unzipped double-

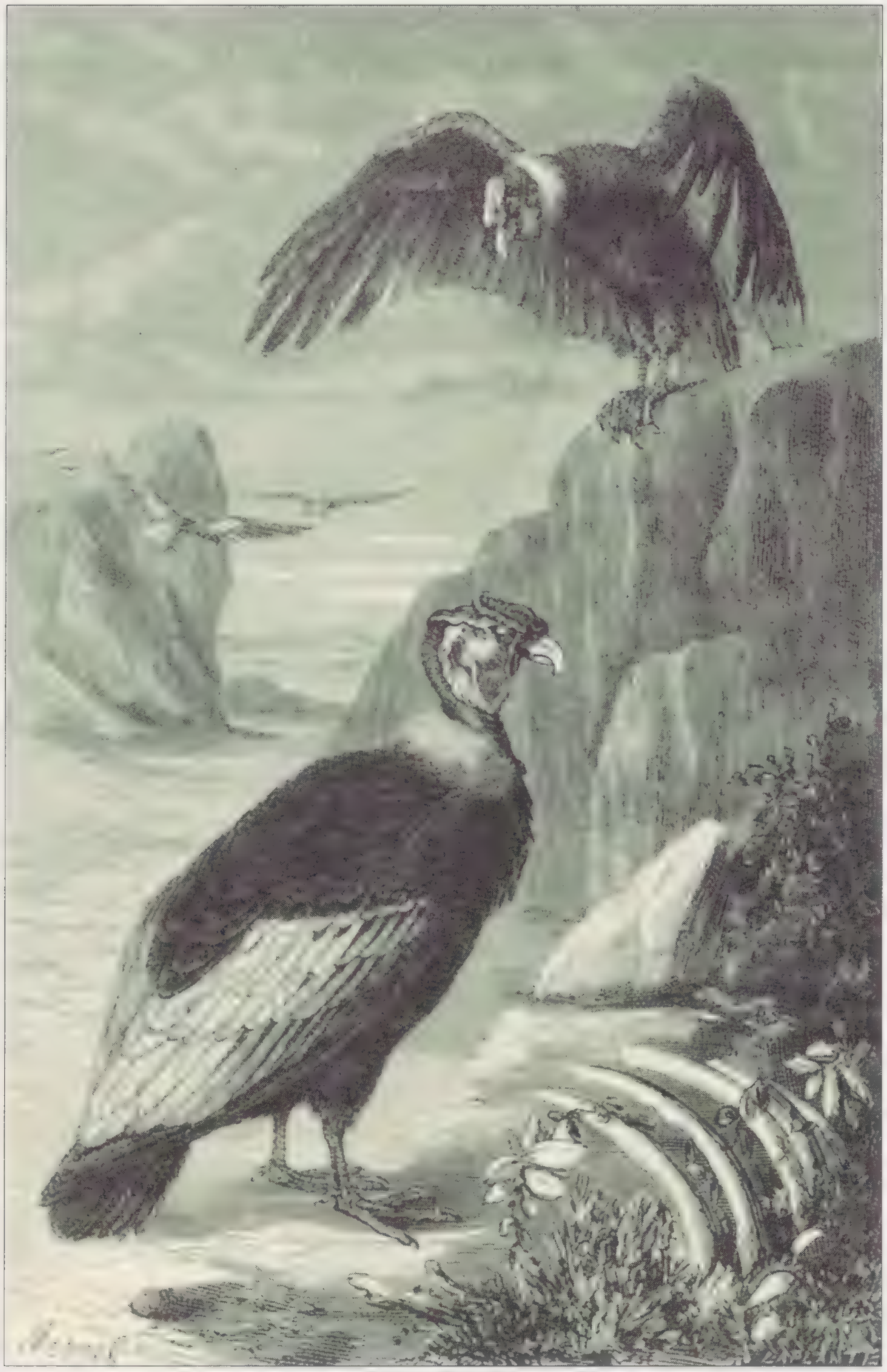


Portrait of Carolus Linnaeus by J. H Scheffel



Linnaeus posed for his wedding portrait, above, in 1739. Although his sketches were amateurish (far left, a northern hawk owl), his other accomplishments were revolutionary. Systemae Naturae, *a catalog of plant and animal species, employs a system of classification still in use today. Some groupings have been revised, however. Ducks and gulls were once considered close relatives because both have webbed feet, left. Today we know that the trait evolved independently in the two groups.*

From *The Universe,* by F. A. Pouchet. New York: Charles Scribner and Co; 1870



The Andean condor, above, had traditionally been grouped with hawks and other raptors. A subsequent revision said New World vultures and condors were really modified storks, not raptors. Melting curves such as this one, far right, generated by researchers Charles Sibley and Jon Ahlquist help to corroborate the revision. Three species—Andean condor (Vultur gryphus), *king vulture* (Sarcoramphus papa), *and yellow-billed stork* (Mycteria ibis)*—are highlighted in yellow. The proximity of the three lines indicates that these three species are more closely related to one another than to the hawks, eagles, falcons, or Old World vultures in the figure.*

stranded molecules in solution will try to re-form. So, if unzipped DNA from one species is put in contact with unzipped DNA from another species, the molecules will try to fuse with one another. Of course, some of the "words" in the genetic code of one species will be different from those in the other species—it's as if some of the zipper teeth will not fit together—so the two single-stranded DNA molecules will not zip together perfectly. But the parts of the DNA that are most similar will fit together most stably, and that stability can be measured. The more stable the fit, the more closely the two species are related.

Thus we now have a technique that can answer such questions as "which group is most closely related to ducks: hawks or sparrows?" And answering those questions is just what Charles Sibley and Jon Ahlquist have spent the last 15 years doing. The results of their studies have just been published in two major volumes that are shaking the world of avian systematics. One is *Phylogeny and Classification of Birds: A Study in Molecular Evolution,* by Charles G. Sibley and Jon E. Ahlquist; the second, which draws on the first, is *Distribution and Taxonomy of Birds of the World,* by Sibley and Burt L. Monroe, Jr., a biology professor at Louisville University in Kentucky and the recent past president of the American Ornithologists' Union. Both books were published by Yale University Press in 1991.

These books represent an astonishing amount of work. Sibley and Ahlquist collected and analyzed tissue samples from over one-sixth of all the bird species in the world—the largest set of DNA comparisons made for any taxonomic class studied to date. Their work is also the first major rearrangement of the orders and families of the world's birds to be undertaken in nearly half a century. Many of the relationships proposed are familiar (ducks and geese still go together, as do hawks and falcons), others corroborate revisions previously considered "heretical" (New World vultures and condors are really modified storks and not hawks), and still others are surprisingly novel.

Many of the surprising findings make biogeographical sense. That is, many similar-looking birds found in different parts of the world are not related at all, but represent adaptive radiations—rapid formation of many new species—in their particular regions. These data suggest, for example, that babblers from two continents—Australia and Asia—are not a single family, and that the Australian radiation of passerine birds is at least as spectacular as the better-known radiation of marsupial mammals.

Phylogeny and Classification of Birds is a complete course in avian systematics, with minicourses in

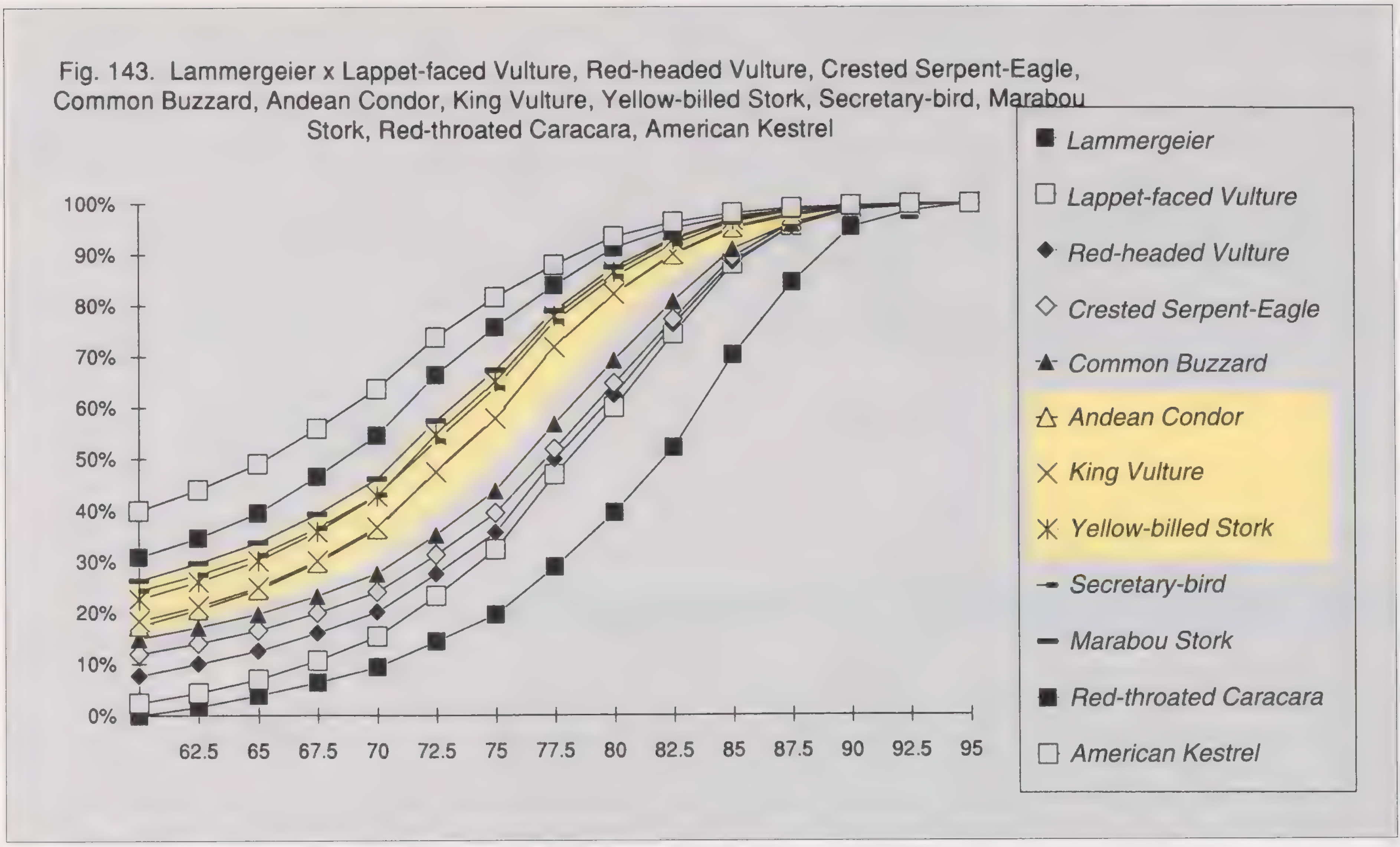


Fig. 143. Lammergeier x Lappet-faced Vulture, Red-headed Vulture, Crested Serpent-Eagle, Common Buzzard, Andean Condor, King Vulture, Yellow-billed Stork, Secretary-bird, Marabou Stork, Red-throated Caracara, American Kestrel

From *Phylogeny and Classification of Birds.* Courtesy of Yale University Press

biochemistry and biogeography. The authors start with brief histories of ornithological classification and the discovery of DNA and its properties. They go on to talk about DNA, gene functions, and regulation. Much of this biochemistry is presented so the reader will be able to understand and assess the methods and conclusions that compose the body of the text. Individual accounts of each group include a list of the traditional anatomical characters that have been used in classification, a historical review of the various classifications of the group, and the DNA hybridization data. The individual accounts are followed by a discussion of biogeography, geological history, and the diversification of birds as evidenced by the data presented. This final discussion is followed by 324 melting curves (graphs that show the stability of the DNA pairs), 61 diagrams of relationships, and 97 pages of "literature cited." A very thorough work indeed!

Distribution and Taxonomy of Birds of the World has a different tone. Much drier reading than *Phylogeny and Classification,* this volume performs a quite different function. It is a species-by-species list of the birds of the world, in the arrangement suggested by the first volume.

For each species, the authors list the scientific name and its author, the year of publication of the original description, an English name, a "world list number" for use in computerization, the habitat where the bird is found, and its geographic distribution. The authors also briefly mention taxonomic problems associated with the species that are outside the purview of DNA hybridization work, and give appropriate literature citations. Some synonyms (old scientific names) are given at the level of genus, and subspecies are mentioned only if their possible status as full species is being debated. The book includes maps of the geographic regions of the world and a gazetteer of the localities mentioned.

Assuming you are an avid birder, should you run out and buy these volumes? Probably not. Both books are highly technical works—must haves for professional ornithologists and those truly interested in the whys and wherefores of avian classification. But without very good (and very recent) training in biology, you might get lost and bored rather quickly.

Even if you don't purchase these books, however, you should be aware of them if you are at all interested in birds, for they will affect you sooner or later. How quickly and how thoroughly will the new taxonomy be accepted by the ornithological community? That remains to be seen; the work is controversial. Eventually, the new order of things will work its way into the field guides, and the arrangement that you have *finally* gotten used to (coots separate from ducks, swifts separate from swallows) will be even more mixed up. But for the insights gained about the radiations and relationships of birds, the inconvenience will be worth it. ■

Kevin McGowan is technical editor of Living Bird.

Spotlight

SLEEPING WITH THE ENEMY

by David S. Wilcove

To escape a dangerous roost mate, must the yellow-shouldered blackbird become a ward of the state?

Supporters of the Endangered Species Act must respond to numerous charges leveled against it by its opponents. Among the most frequently heard accusations are three relating to the costs and benefits of the act: it blocks economic growth and development; it is blind to the economic impacts of endangered species protection; and it has failed to save many species from extinction. Why, critics complain, must we pay such a high price for so few benefits?

The economic arguments are easily rebutted if one takes time to learn the facts. Between 1987 and 1991, for example, the U.S. Fish and Wildlife Service (USFWS) reviewed 73,560 development projects and permit applications for potential conflicts with endangered species. Only 18 of these projects were actually blocked because of endangered species. That's less than three one-hundredths of 1 percent of the projects—hardly evidence that the Endangered Species Act is shutting down the engines of economic growth.

The second accusation—that the act prohibits consideration of the economic impacts of species protection—is also untrue. The act has special provisions that enable developers to destroy portions of an endangered species's habitat if they can provide suitable mitigation elsewhere; the boundaries of officially designated "critical habitat" can be altered if economic impacts are deemed too great; and there is a mechanism to exempt projects altogether from the act (as was done recently by the Bush Administration for federal timber sales in the habitat of the northern spotted owl).

But the third accusation—that the act isn't working—is not so easily dismissed. Of the hundreds of species that have appeared on the endangered species list, only five have ever been removed because they recovered. A disappointing number, to be sure. But is it reasonable to expect a 19-year-old law to completely undo the harm that has accrued to these species over the course of centuries? A more telling statistic is surely the more than 200 species identified by the USFWS as either stabilized or improving due to protection under the Endangered Species Act. If the law hasn't brought these plants and animals back to their former abundance, it has at least prevented them from disappearing altogether. One example is the yellow-shouldered blackbird or mariquita of Puerto Rico, a little-known relative of the red-winged blackbird that has been pulled back from the brink of extinction, thanks to the Endangered Species Act and a small but dedicated group of admirers. Its story illustrates the difficulty of truly recovering endangered species and provides a warning about a new threat to the songbirds of North America.

As late as the 1930s, yellow-shouldered blackbirds were plentiful in the lowland areas of Puerto Rico, where they nested in mangroves, pastures, palm plantations, cactus-scrub, and coastal cliffs. Little attention was paid to the species until 1972, when a population survey showed only about 2,400 individuals remaining in three localities. Four years later, the yellow-shouldered blackbird was declared an endangered species. Its numbers continued to dwindle, with a 1989 estimate placing the total population at 720 birds.

The expansion of sugarcane cultivation and the growing number of housing developments in Puerto Rico surely played a part in the yellow-shouldered blackbird's demise. By 1968 only about a quarter of the blackbird's original feeding and nesting habitat remained undisturbed. Also, Puerto Rico, like most islands, has been contaminated by a multitude of unwelcome species introduced either intentionally or accidentally by people. Ship rats and mongooses, for example, prey on blackbird eggs and nestlings, forcing the birds to nest on small islands, in cactus and palm fronds, or on steep cliffs, out of the reach of predators. But in recent years, the most serious threat to the yellow-shouldered blackbird has been a fellow blackbird: the shiny cowbird.

Like the brown-headed cowbird, the shiny cowbird is an obligate brood parasite. It lays its eggs in the nests of other birds at the expense of the host's own eggs or offspring. Once restricted to South America, the shiny cowbird has expanded its range and increased its numbers as tropical forests have been converted to cattle pastures and farmland. It colonized the Lesser Antilles and spread westward, reaching Puerto Rico in 1955. There it encountered birds with little evolutionary exposure to cowbird parasitism and few defense mechanisms against it. In the case of the yellow-shouldered blackbird, the consequences were deadly. Studies conducted in the 1970s and early 1980s by ornithologists James Wiley and Will Post documented the extraordinarily high rates of nest parasitism afflicting yellow-shouldered blackbirds. In two of the three remaining populations of yellow-shouldered blackbirds, 90 to 95 percent of the nests were parasitized by shiny cowbirds. Because parasitized nests produced far fewer host offspring than unparasitized ones, blackbird numbers plummeted.

In recent years, the government of Puerto Rico and the USFWS have taken a number of steps to reverse this decline.

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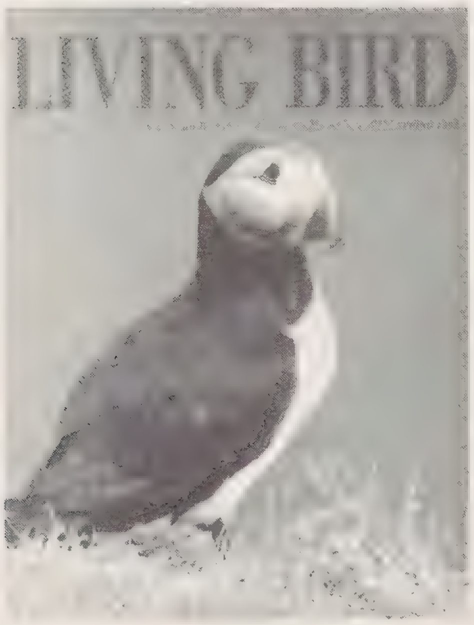

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(607) 254-BIRD

Researchers placed nest boxes in woodlots to attract yellow-shouldered blackbirds, and set up cowbird trapping programs around blackbird colonies. Are these efforts working? I learned the answer to that question in February, when I was invited to participate in a biannual census of yellow-shouldered blackbirds in southwestern Puerto Rico.

Late one afternoon, our small group of biologists scrambled into canoes and paddled out among the mangrove forests fringing the coast. As the light waned, small flocks of birds hurried into the dark, impenetrable mangroves to roost. Among them were three species of blackbird: Greater Antillean grackles, shiny cowbirds, and yellow-shouldered blackbirds. From our canoes we scanned the sky in all directions, hoping to spot and identify the fast-moving birds before they reached the security of the mangroves. The long, keeled tails of the grackles made them easy to identify, but when a blackbird with a short tail flew by, all eyes focused on the wings. Lemon-yellow patches signified a rare yellow-shouldered blackbird, all-dark wings meant a shiny cowbird. The irony of the situation was inescapable: here were yellow-shouldered blackbirds going to roost with their nemesis, sleeping with an enemy they had reared as their own offspring.

With the light fading, the chorus of blackbird chatter emanating from the mangroves grew quiet. We paddled our canoes back to shore and tallied the results: 336 Greater Antillean grackles, 5 shiny cowbirds, and an astounding 172 yellow-shouldered blackbirds. It was the highest count ever of yellow-shouldered blackbirds at this particular site. Hector Colon, biology professor at the University of Mayaguez, shook his head in happy disbelief. Five years ago, when he last participated in the census, he had scanned flock after flock of shiny cowbirds, spotting only an occasional yellow-shouldered blackbird. Today, the opposite had occurred.

Yes, the yellow-shouldered blackbird is making a comeback, with a little help from its friends. But what are the long-term prospects for its recovery? The shiny cowbirds are here to stay, and if left uncontrolled, could quickly eradicate the blackbirds. One is left with the uncomfortable feeling that the yellow-shouldered blackbird has become a ward of the state, a bird whose survival may forever depend upon the constant vigilence of humans. In this respect, it is no different from the Kirtland's warbler, least Bell's vireo, or black-capped vireo, all of which still survive thanks to control programs for brown-headed cowbirds.

Critics who carp about the paucity of endangered species success stories conveniently overlook the irrevocable and massive alterations we have made to the land. By clearing forests and bringing livestock to almost every corner of the New World, we have created a paradise on earth for cowbirds and unrelenting problems for many of their hosts. Is it even possible to "recover" populations of host birds under such circumstances?

The biologists I talked to in Puerto Rico are not ready to concede defeat. They are hoping to build the populations of yellow-shouldered blackbirds to levels high enough to withstand parasitism by shiny cowbirds, thereby eliminating the need for constant management. Whether this can be done remains to be seen.

I certainly hope they succeed, for more reasons than a fondness for yellow-shouldered blackbirds. Shiny cowbirds have begun to colonize the continental United States, with regular sightings reported from Florida and Louisiana and occasional records as far north as Maine. It is only a matter of time before they begin to parasitize our warblers, vireos, and other songbirds. I have no idea how well continental songbirds will weather this latest threat to their well-being, coming on the heels of so many others, and I dread the thought of the cerulean warbler or black-whiskered vireo one day appearing on the endangered species list. But should that day ever come, they will have a second chance for survival, thanks to a law that its critics claim doesn't work. ■

David Wilcove is an ecologist with the Environmental Defense Fund in Washington, D.C. He also serves on the board of directors of the U.S. and Pan-American sections of the International Council for Bird Preservation.

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JAMES WILEY

The yellow-shouldered blackbird has been pulled back from the brink of extinction, thanks to the Endangered Species Act.

BIRDING IN THE FOURTH DIMENSION

by Jack Connor

Travels through time boost your birding enjoyment

The thought struck so hard it felt like a muscle cramp of the forehead. I jerked upright in bed, groaned, stood groggily, and shuffled to the bathroom for a drink of water. The tiles were cold beneath my feet. The water tasted like gloom.

A couple of hours earlier my wife, Jesse, and I had been sitting at a dinner with half a dozen other birders when the conversation had shifted from a pleasant discussion of the Swainson's warbler reported at Higbee's Beach that afternoon to an analysis of Bob Barber's hearing loss. Bob confessed his 50th birthday was coming up, and the thirtysomethings at the table wanted all the grim details. "What birds can't you hear any longer, Bob? How about blue-winged warbler?"

"Oh, I can still hear blue-winged," Bob said, smiling, "as long as it's no more than 20 feet away and the wind isn't blowing."

"Eastern wood pewee?"

Bob laughed. "I haven't heard a pewee in years. I can stand right under them, see their bills open, watch their tails moving. I *know* they're singing, and I can't hear a thing."

As the conversation shifted again, Bob leaned toward me, the next oldest person at the table, and whispered, "But my New Jersey list is at 352 and I'm adding another one tomorrow."

"You're thinking that Swainson's will stick around?"

"They say he was singing all afternoon. It should take him at least another 24 hours before he realizes he's a couple of hundred miles north of the nearest female."

Jesse and I agreed to meet Bob at Higbee's the next morning, and soon after said goodnight so we could get an early start. Back in bed, though, I couldn't sleep. My own birthday happened to be only two days away and I had a bad case of another-year-older blues, inflamed by the dinner conversation and by my worries about my own aging process.

One evening this spring Jesse and my son heard a whip-poor-will from our back deck. Cupping my hands behind my ears, I could hear the squawks of a backyard toad, the whir of our water pump, and the electric spit of my neighbor's bug-zapper, but no bird sounds reached my brain. "There he is again," said Jesse. Then seeing my blank face, she added kindly, "Well, he's pretty far off."

"Geeze, Dad," said Blake, "you couldn't hear *that*?"

One day I rolled up a newspaper and swatted three times at a fly on the picture window in the living room. All three blows seemed to hit him dead on, but he fluttered up and returned after each, as if untouched. While I squinted to prepare for my fourth and most ferocious swing, my dim eyes focused long enough to perceive the problem: the fly was on the *other side* of the glass.

"Old Timers' Disease" my son calls it. "The Beginning of the End" was what I decided it was that evening in bed, during my struggle with insomnia and self pity. And it was right about there when that truly painful thought struck home, the one that jolted me upright:

"I haven't heard a pewee all year!"

It was mid-May, and the species was absent from my year list. Ordinarily, I might have blamed the late spring or the decline in neotropical migrants. Now it seemed a good possibility that I was experiencing a more personal tragedy. Subtract five years from Bob Barber's age and you get mine. Had I heard my last pewee ever?

I shuffled back from the bathroom, then stared at the dark ceiling. The more I thought, the worse I felt. I had to lose my first bird soon, I knew, most likely one of the high-pitched singers—pewee or blue-winged or blackburnian—and that would only be a sign of other losses to come. How do older birders keep their spirits up while their perceptive abilities grow duller?, I wondered. I have to give up birding, I decided. It's getting too depressing.

When Jesse and I arrived at Higbee's the next morning and saw Bob standing by his car, something in the way he held his shoulders signaled success. "My guess is," I said, "you've already found it."

He nodded and smiled. "Singing up a storm in Catbird Corner."

He led. We followed. Bob Barber has been leading us to rarities for 17 of the 18 years I've been chasing birds, since we first met him in Merrit Island, Florida, in 1975, and he gave us directions to a long-billed curlew on a mudflat down the road. Soon after he took us out on a pelagic trip, taught us how to tell parasitic jaegers from pomarines, and then, just as that lesson had finished, pointed into a swirling flock of a hundred laughing gulls and said, "There's a Franklin's!" The bird landed on the waves, bobbing high, and stayed with us the rest of the afternoon, long enough for everyone to study its field marks under Bob's friendly guidance. It was a life bird for nearly everyone on board and is still the only Franklin's gull I have ever seen on the Atlantic Coast.

By lucky coincidence Bob moved from Florida to South Jersey about the same time Jesse and I did, and so we have had the pleasure of his company and spirited conversation—about warblers, seabirds, pine snakes, ant lions, damselflies, home schooling, environmental impact laws, and countless other topics—during many hours in the field over the last dozen years. No one makes a better companion in the field than Bob Barber does.

A loud, long song swirled out of the woods: *sweet, sweet, swee-oh, tickety, wick, blip.* "That's him," said Bob, "like a Louisiana waterthrush tumbling over himself at the end."

We ducked into the forest, followed Bob to a sun-dappled semi-clearing under the canopy, and stopped. The bird teased us at first, singing from somewhere far to the left, then close on the right, then above and behind us, while we spun in our tracks and tried to spot movement in the green and gold light. "Come on, Swainson's," said Bob. "Where are you?"

The bird popped up a moment later, on a strangler vine 15 feet above the ground. He looked like a cross between a house wren and a red-eyed vireo: bobbed tail, brown back, white eyeline, and heavy bill. "Short at one end," said Bob, "big at the other." He flitted from one perch to another and sang eight or nine times while we watched, throwing his head back all the way and shaking with the effort. His song was not the wimpy shriek of a pewee or the weak, thin whistle of a blackburnian, but a reverberating, full-bodied carol that drowned out other birds. Finally, having given us all we deserved, he disappeared back into the depths of the woods.

Bob and I exchanged high fives. Jesse and Bob exchanged a hug and a kiss.

Walking out of the woods, we got talking about the special pleasure of seeing a bird again that you have not seen in many years. My only other encounter with a Swainson's warbler had been in April 1976, and as inexperienced as I was in those days, I had thought it no more significant a sighting than the other two life birds I spotted that day—rose-breasted grosbeak and yellow-throated vireo.

"Sixteen years later it's more of a thrill than the first time," I said.

"Now you know enough to appreciate what you're looking at," Bob agreed.

Time invested means perspective gained, I have come to realize, and you can't have the perspective until you've put in the years. When Proust tasted the madeleine as a child, it was only a finger cookie. Putting in the years means keeping at it until your eyes and ears wear down, but that's the price you must pay for full admission into the next dimension of birding. It is in the fourth dimension where older birders are at their best. Younger birders see and hear better; older birders *know* better.

So, I'm not going to turn in my binoculars. No, I plan to keep carrying them around, come what may, and I plan to keep following Bob Barber around, too. I still need Franklin's gull for my New Jersey list. ■

ILLUSTRATION BY TIM BURGARD

MORE ON COMPUTERIZED LISTING, AND THE ULTIMATE BIRDING MOBILE

In the Summer 1992 issue of Living Bird *we reviewed seven bird listing software packages, all written for the IBM computer or compatibles. While we were putting the review together, a new package came on the market, and we missed it. So here it is . . .*

AVISYS

Perceptive Systems
P.O. Box 1908
Lafayette, California 94549
(800) 354-7755

PRICE: $69.95 plus $4.00 shipping and handling

REQUIRES: one or two 3 1/2" or 5 1/4" floppy or one hard drive, 512K RAM

The AVISYS manual is excellent: easy to follow, with simple directions for installation. The package allows you to input sightings relatively quickly, on a par with two other highly rated software packages, PLOVER and AVES. You select species by scrolling quickly through an on-screen North American master list. To go even faster, AVISYS allows you to skip large sections of the list by searching for part or all of a species name, or by using "quick-keys" to move immediately to a specific family. For example, press CTRL-G to move to the gulls. For each species you enter, there's space for numbers and comments, and a second field for more extensive notes. The manual even shows you how to draw a simple map.

One well-designed AVISYS feature allows you to link geographic locations for automatic list updating. For example, I can designate Sapsucker Woods as a local listing site and link it to the city of Ithaca, New York State, the United States, and North America. Then, every time I put in records for Sapsucker Woods, all the other lists are updated too.

Like other good bird-listing software packages, AVISYS can produce target lists and lists of species seen for North America, the United States, Canada, each state or province, counties, and local sites, as well as lists for specific time periods. It also lets you produce custom checklists (*not* a common feature of listing software), and print them with a number of options. Unfortunately, if you want a checklist for a particular state, you must construct it yourself by choosing species from the master list. It would be handy to have state lists already available, as does another program, DATAHAWK.

AVISYS can also generate census reports—number of birds or number of sightings per month—in spreadsheet format. Sighting records can be easily exported to databases and spreadsheets for more detailed analysis. One other nice feature is the "attribute" facility, which lets you designate codes for sex, age, behavior, nesting, and so on, and place them in the comment field. You can then select records according to these attributes.

In sum, AVISYS is an impressively well-designed program that will delight both listers and record keepers.

—Jeff Wells

Now, for the MacUsers in the audience, we review two listing packages designed for that other computer.

BIRD BRAIN 2.0

Ideaform, Inc.
P.O. Box 1540
Fairfield, Iowa 52556
(800) 779-7256

PRICE: $125.00 post paid ($50.00 to upgrade from Bird Brain 1.0)
REQUIRES: 1.5 Mb RAM and a hard drive. Runs with Macintosh System 6.03 or later (including System 7.0). Supports 32-bit addressing

If you want to keep track of bird sightings with a Mac, Bird Brain 2.0 is just the ticket. Installation is effortless—literally "point and click." Based on the powerful Double Helix relational database, Bird Brain is quick and flexible.

The AOU checklist, 6th edition (the one used to organize most field guides) is on line. Entering records is painless—all you do is type a few letters of the bird's name, and the program fills in the bird's complete common name and scientific name. You don't need to remember and enter the four-letter banding code, although entering the code works too. The program also provides page references for the most commonly used field guides, including *The Birder's Handbook.*

Instead of having to retype information every time you visit your favorite birding spot, you can customize menus for location and habitat information. You can also tag the records you want to keep together. For example, you can tag "heard-only" birds or birds whose nests you have found. Each record has ample space for notes, more than most people would ever use—so you can include descriptions of rare sightings for the state record committee.

Bird Brain automatically maintains your life list for ABA, AOU, world, and state/province areas. And when you enter your sightings at the end of a field trip, it also automatically adds birds to year and state lists. You can generate a variety of reports—for example, I made a list of heard-only New Jersey birds—and you can print them on an ImageWriter, StyleWriter, or LaserWriter printer and compatibles. I had no problems printing on our aging Hewlett Packard LaserJet IID.

This program has only two drawbacks—you can't easily generate "target lists" of birds you would like to find in a certain location, and it requires a fairly new and powerful Mac.

NORTH AMERICAN BIRDS

Gerry Rising
295 Robinhill Drive
Williamsville, New York 14221
(716) 689-8301

PRICE: Free! Just send a formatted disk and an envelope with return postage to the above address
REQUIRES: Microsoft Excel (any version)

North American Birds is a basic source that birders can use to create, customize, and maintain a variety of birding lists. Unlike the other bird listing software we've reviewed, NA BIRDS is simply a file—a list of common and scientific names for 870 North American species. To use this file to manage your bird lists, you must already own Microsoft Excel, a popular electronic spreadsheet for the Macintosh. Excel is expensive (version 3.0 costs over $300). But if you already have Excel and know how to run it, NA BIRDS is a no-cost way to get into computerized listing.

The instructions included with NA BIRDS—there is no manual—are good, but they assume a working knowledge of Excel. Excel's powerful sorting abilities let you use NA BIRDS to create life lists—in checklist order, in order of first observation, by year, and by ABA difficulty code—as well as regional lists, monthly lists, lists organized by arrival and departure date, and daily observations. The creator of NA BIRDS, Gerry Rising, has included sighting data (arrival, departure, and monthly occurrence) for the Buffalo, New York, region to give users an example of how NA BIRDS can be customized.

NA BIRDS and Excel combine to make a powerful and useful listing program, especially for birders who already own Excel and know how to use it. Commercial programs are flashier, with their pop-up menus and automated functions, but they also cost real money.

—Todd Culver

1992 FORD EXPLORER
"Eddie Bauer" Model

We've driven a lot of different cars in World Series of Birding competitions. Most of them have been disappointments in one way or another. The ultra-steamlined vans with sliding side doors were awkward to get in and out of from the back seat. Station wagons were too low to the ground and didn't handle well on rough roads.

For the 1992 World Series of Birding we were determined to drive a vehicle that was roomy, comfortable, and up to the demands of a grueling big day competition. Ford Motors graciously offered to lend us a brand new four-wheel-drive, four-door Explorer to drive for the entire week of pre-big-day scouting and on World Series Saturday.

The Explorer they lent us was the deluxe "Eddie Bauer" model with sunroof, built-in rooftop luggage rack, and plush seats. The front seats are a real joy—with the simple touch of a switch they move backward, forward, up, and down. Also, the driver's seat sides pinch in or spread out to fit your shape, *and* the lower back area of the seat moves independently to provide custom lumbar support. The seat was so comfortable that no one wanted to give up driving, even after hours behind the wheel.

TIM GALLAGHER

The Explorer's 160-horsepower, 4.0 liter, electronically fuel injected V-6 engine was a powerhouse, lugging the five of us and all our gear (and food) more than 500 miles on World Series Saturday alone. The dual front cupholders on the floor console were a nice touch and saved us from some disastrous spills. Everyone liked the smooth-operating power windows on all four doors. We attached a rooftop carrier to the built-in rack on top for our luggage, which freed up the area behind the back seats for tripods, scopes, submarine sandwiches, and other essentials.

But the feature that really sold the team on this vehicle was the see-through sunroof; when we took out the removable inner headliner piece, everyone in the car, front and back seats, had a decent view of the sky. This proved vital a couple of times with flyover birds, giving everyone a chance to see them and verify their identities. The sunroof also popped up, allowing us to hear warblers singing above us as we cruised slowly through woodlands.

Our Explorer had a four-speed automatic transmission with overdrive. Shifting into four-wheel drive was accomplished simply by touching a button on the dashboard. This was a saver one time as we were slipping and sliding up a steep, muddy dirt road; we shifted into low range four-wheel drive and the Explorer immediately straightened out and raced up the hill.

On or off the road, the Explorer drove remarkably smoothly. In many ways it felt more like a car than a truck, probably thanks to the gas-pressurized shock absorbers and the front and rear stabilizer bars. The fuel economy was decent for a vehicle of this kind: 15 MPG city; 19 MPG highway. The 19-gallon fuel tank allowed us to go a long way between fill-ups, but an extra tank would be helpful for a big day, allowing you to drive all day without stopping for gas.

The Sapsuckers unanimously agreed that the tinted back and rear side windows were a disadvantage for the backseat birders. The tint affected visibility, and most of us rolled the windows down whenever we rode in the backseat, despite the freezing weather. But the windshield and side front windows were fine.

In conclusion, the Ford "Eddie Bauer" Explorer is a dream machine for birding, carrying five adult birders comfortably with all their gear. If you don't find the price tag daunting ($23,553), this vehicle is well worth considering come trade-in time.

—Tim Gallagher

FOR MELINDA WITH LOVE AND SQUALOR

by Pete Dunne

My biologist/birder friend reached over from the driver's seat of her car and opened the passenger door for me, dislodging an avalanche of Styrofoam cups, fermenting hoagie wrappers, pistachio shells, cassette tapes, and a well-seasoned, road-killed Virginia rail.

"So that's where that rail went," she said, grinning. "Just throw your gear anywhere," she invited, gesturing to the rear, toward a massive pile of debris that appeared to include half the contents of the library of Alexandria, elements of at least two mismatched tripods, a spotting scope still being carried on some university's inventory, a cooler filled with benthic samples and long-neck bottles, a parachute, a sleeping bag, a pair of chest waders, the car's muffler, and two pairs of clogging shoes.

Huh, I thought as I searched for an empty nook, I didn't know Melinda was into clogging. Melinda must have taken my hesitation for aversion.

"Uh, sorry about the mess," she began, "but . . . . "

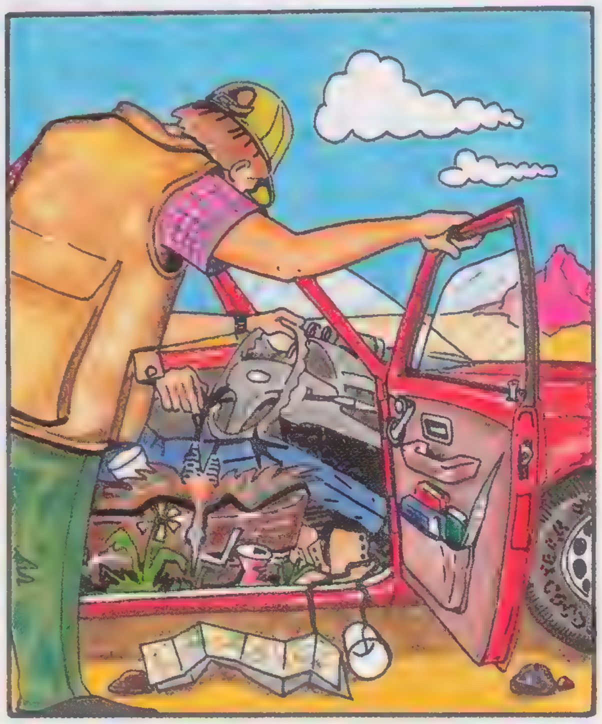
"Don't mention it," I said, cutting her apology short as I selected a spot to toss my stuff that wouldn't topple the pile or restrict access to the cooler. "My VW Rabbit is named Pig Pen," I explained.

"Oh," she said, smiling again and patting the dashboard of her Pinto sedan with affection. "Pete, meet Detritus."

I'm not saying that all birders treat their cars the way the Romans treated Carthage during the Third Punic War or that the average birding-mobile looks like it was lifted from the screen set of "The Grapes of Wrath." I've known birders whose vehicles were as spotless as operating rooms; birders who consider Windex and a portable vacuum cleaner as indispensable as a lug wrench and jack.

But most birders (at least the ones who grudge me access to their cars) seem to have a more cavalier attitude toward their auto interiors, and many of these acquaintances are plainly indifferent to them.

Consider Rick Blom, a Maryland birder whose VW Golf looks like it's been slept in—which it has, over and over again. As Maryland's Breeding Bird Atlas coordinator, Rick has probably logged a lot more "Z" time in his automobile than the average small-town, graveyard-shift patrolman.



Consider Judy Toups of Mississippi. Judy's spunky Honda Civic is a veritable automotive midden, filled with tokens and treasures enough to humble the efforts of the most avaricious pack rat.

Or consider my venerable old Pig Pen, whose deposition of tracked-in debris was so thick come trade-in time that it had geological strata. The top several layers were dry and desertlike. But the underlying sediment, from mid-depth to metal core, had characteristics consistent with your basic Pleistocene swamp.

My current wheels, a Saab 900 (dubbed "Pete's Pit" by my wife, Linda), is the latest in a proud line of dumpsters on wheels. Everything, I mean *everything*, I might ever need in the next five years is stashed in that car.

How do I know this? Because it has taken me five years to provision the Pit properly. Every time I went birding (shorebirding, pelagic birding, hawk watching) and put some important accoutrement (window mount, rain pants, lucky hawk-watching visor) into the car, well, it just *stayed* there.

Now, say I'm birding at Brigantine in July and I need an expedition-grade goose down parka to save a fellow birder whose air-conditioned rental car has brought him to the brink of hypothermia. Well, I've got one.

Or say I run into Peter Matthiessen and I want him to autograph a copy of *Shorebirds of North America.* Well, I've got one of those, too. It turned up just the other day while I was searching for the 40x eyepiece that fit the Balscope Senior I dropped off a jetty in 1974. I finally found it (the eyepiece, not the book) in the panel pocket of the 60/40 cloth jacket I was wearing the day I met Maurice Broun. The jacket had unaccountably found its way into the duffel bag that contained my hip-hugger bell-bottoms, Nehru jacket, and a work shirt embroidered with scenes inspired by *The Lord of the Rings,* instead of being in the old milk crate that used to house my collection of eight-track tapes where it belonged. Small wonder it took so long to find it.

Now, you're probably wondering why I can't just take all this stuff out of the car, store it at home, and draw upon it when I need it. Well, I certainly could! If I could predict when and where I was going to meet a hypothermic birder in July or run across a Balscope Senior in need of an eyepiece.

Or if home were a more orderly and organized place than my car—which it is not. As a matter of fact, if you *really* want to see chaos, come take a look at my office. It makes what the Romans did to Carthage look like urban renewal. ■

ILLUSTRATION BY JEFF SIPPLE

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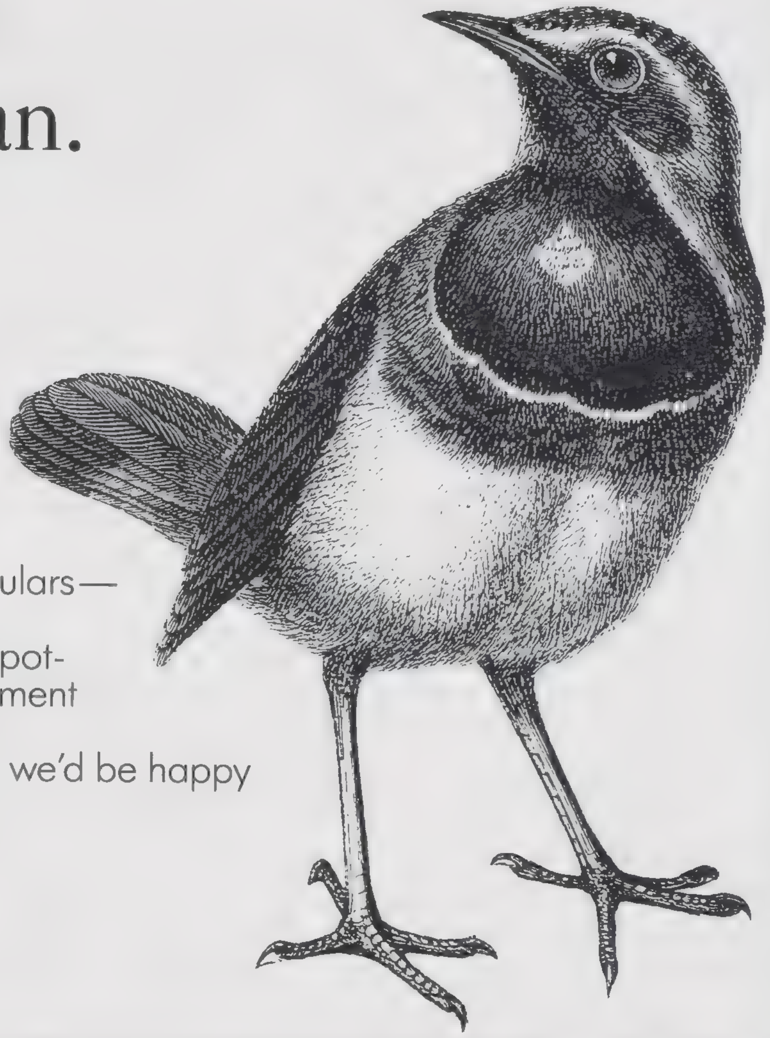

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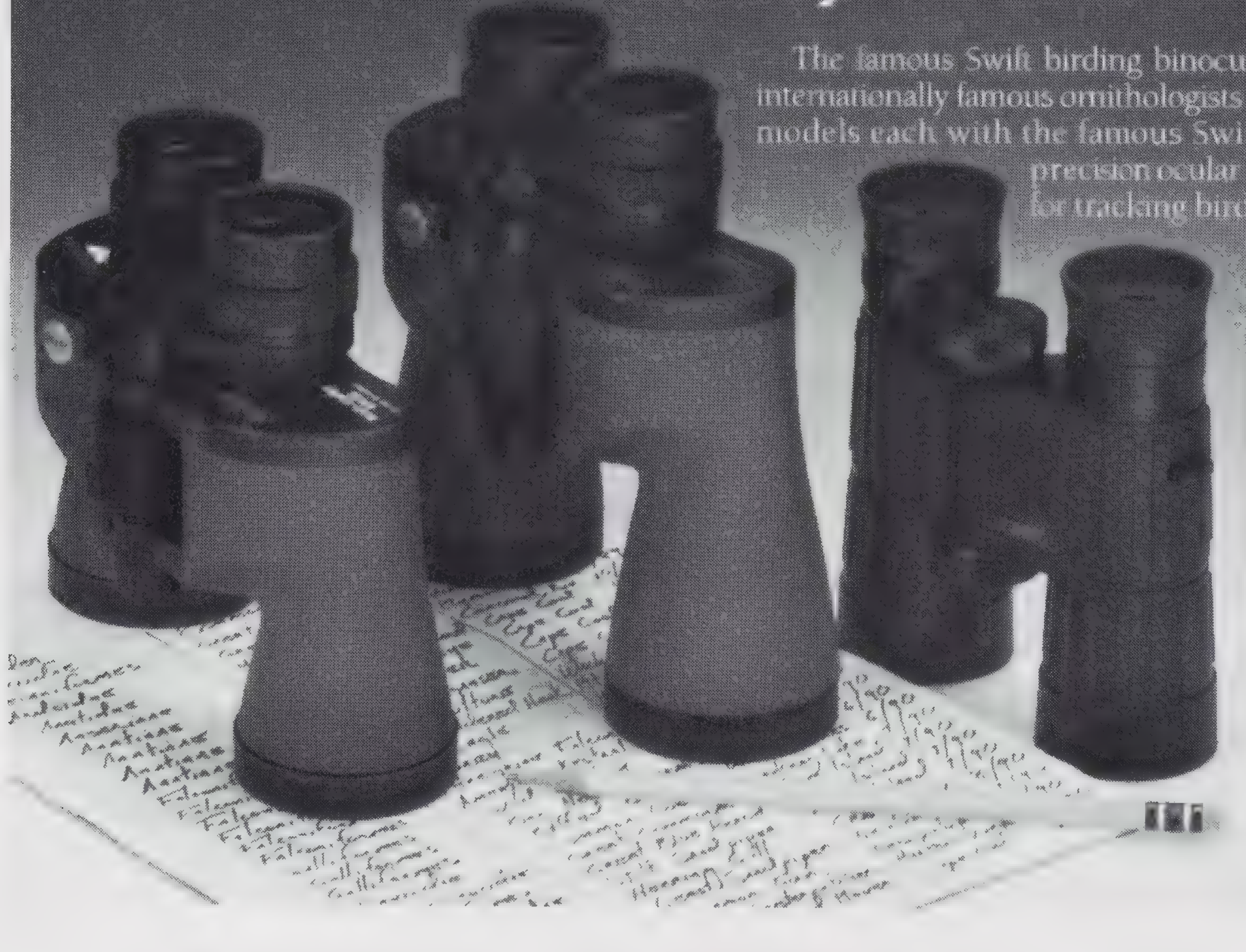

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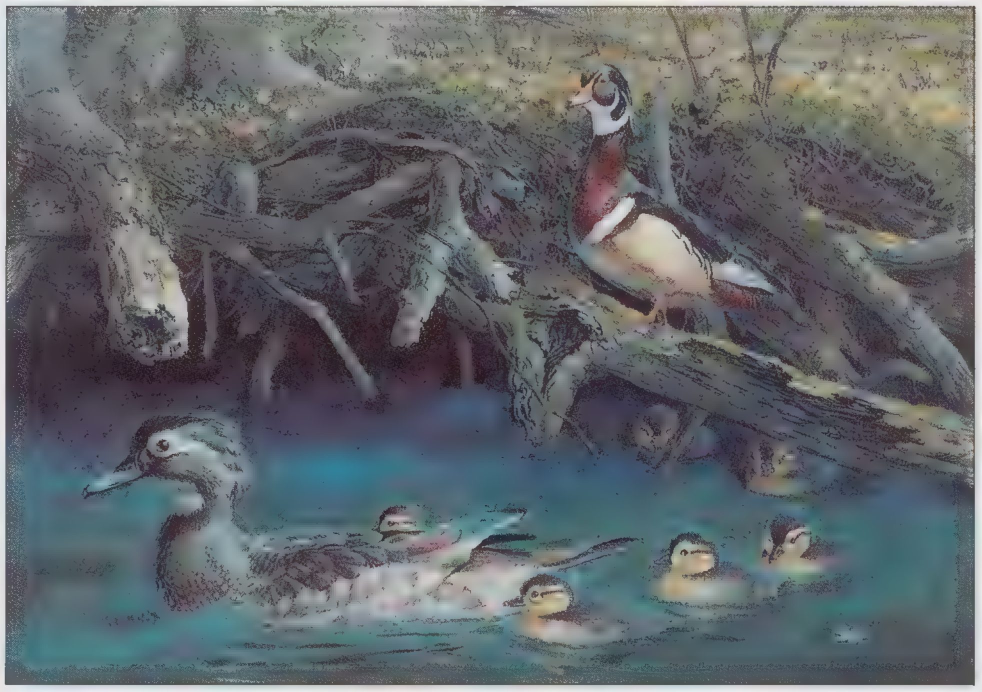

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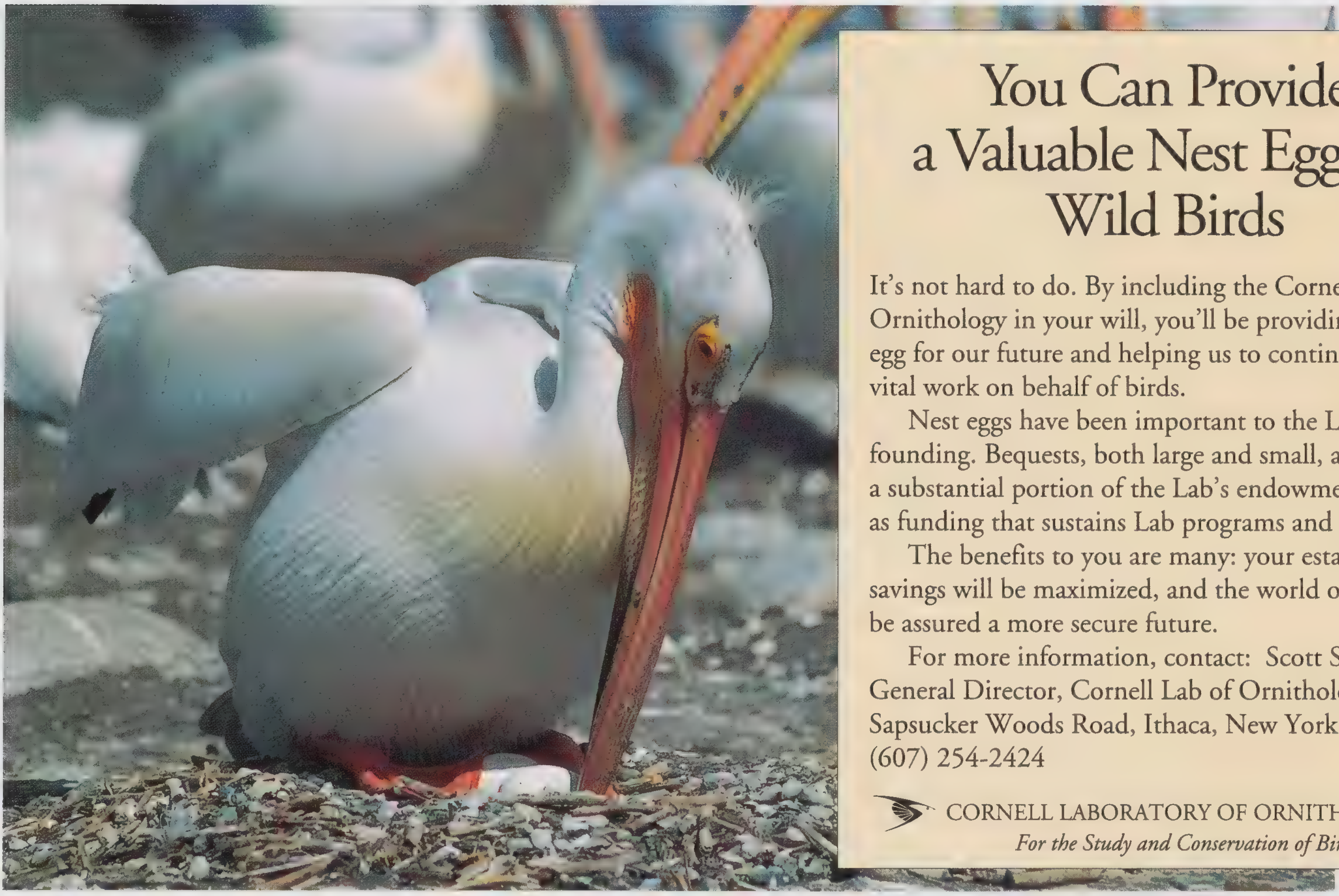

AMERICAN WHITE PELICAN BY TIM GALLAGHER

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A Publication of the
Cornell Laboratory of Ornithology

LIVING BIRD

SPRING 1993 VOLUME 12 NUMBER 2

Greetings from Sapsucker Woods

As we draw ever closer to the end of the 20th century (and also the end of this millennium), I wonder about the legacy we will leave behind for the people and other living things who come after us. Will we pass along an ecologically devastated planet, devoid of many life forms that exist today, or will we have changed our ways by then and preserved Earth's rich biological diversity?

Clearly we need to encourage a new ethic; to raise public perceptions of the intrinsic value of intact habitats and wildlife populations. It won't be easy, but it *can* be done. Education and involvement are the keys. We're trying to do our part at the Lab of Ornithology by increasing our role in public education, striving to foster an appreciation of birds by the broader public.

Encouraging amateurs to participate in scientific research is an excellent way to get people more interested in birds and the environmental factors that affect them. Ornithology is one of the few sciences that still welcomes (and relies on) the contributions of skilled amateurs. Birders who participate in field research provide vital data on bird behavior, population trends, and more. The Lab is currently developing new research programs that will make full use of the vast resource that birders represent.

One such program is Project Tanager, introduced in this issue's "Beyond the Field Guide" column. Birders in most of the 48 contiguous states and western Canada can participate in this project, which will study the effects of forest fragmentation on the breeding success of North American tanagers—scarlet, summer, western, and hepatic. We encourage all of you to join this worthwhile project. The data you gather could be an important tool for scientists, conservationists, and land-use planners. Together we can make a difference.

— *Tim Gallagher, Editor-in-Chief*

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Cover: *In spring the avocet's drab, gray head and neck feathers change to a rich, rusty cinnamon—a transformation that only adds to this stately wader's beauty. Participants in the Lab's sound recording workshop had a chance to tape the avocet's piercing call. Story on page 22. Photograph by D. Robert Franz.*

Right: *Though small in stature, tree swallows show fierce spirit when fighting over the feathers they use to line their nests. Read about this fascinating behavior on page 30. Photograph by Johann Schumacher.*

Back Cover: *A determined marsh wren does the splits while performing his reedy, gurgling song. Photograph by Marie Read.*

LIVING BIRD

SPRING 1993 VOLUME 12 NUMBER 2

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts. © 1993 Cornell Laboratory of Ornithology.

Printing by Cayuga Press, Ithaca, New York
Color separations by Brodock Press, Inc., Utica, New York

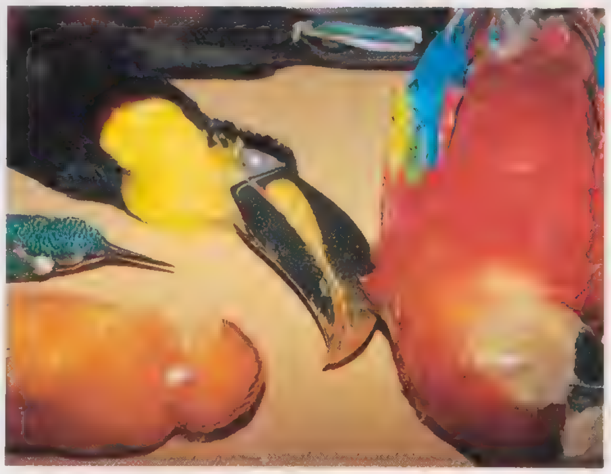
Letters

Shawnee Memories

Jerry Sullivan's "Sinking in the Shawnee" (Autumn 1992) was a fine article, although readers unfamiliar with the geography of Illinois might have benefited from a map of the area. His description of summer weather in the Shawnee National Forest—"like standing under the exhaust vent of a clothes dryer"—brought back vivid memories of my graduate years at Southern Illinois University in the late 1960s. Violent summer storms, clouds of pesky, biting insects, and cold winter rains are part and parcel of that section of the Ozark foothills.

Unfortunately, it appears that management of sections of the Shawnee has favored cowbirds at the expense of neotropical migrants. Now, with Scott Robinson's data in hand, it's time to do battle with the cowbirds. But as his research points out—are there short-term solutions?

Richard Askeland
Syracuse, New York



TIM GALLAGHER

Salmon Fly Sensationalist?

Concerning Ted Williams's article, "The Ugly Salmon Fly" (Autumn 1992): I happen to have a 23-pound salmon entered in Sutter's log, taken in September 1991 at just about the same spot where Mr. Williams is standing with his 22-pounder. At this point our interests part.

I have enjoyed Ted Williams's articles for years, but I feel he is, perhaps, running out of material. His article some months ago in *Audubon* about shooting preserves had many elements of truth, but when he saw fit to describe one particularly notorious released-pheasant operation as "typical," I tore up my renewal notice from the National Audubon Society.

Again, there were certain truths to his article in *Living Bird* on decorative salmon flies, but I haven't been able to find one fly tyer who isn't either highly amused or highly distressed by the implication that fly tyers are imperiling endangered species. Feathers from captive-bred birds or other substitute materials are now used; there simply is no horde of so-called "purists" out there. Suffice it to say that this article so overstates the extent of the illegal trade that it can be classed only as sensationalist journalism. The theatrical photograph of museum skins accompanying the article is a case in point.

I sincerely hope I do not find a Williams article in your publication again or in any other magazine I admire and enjoy.

Wright Montgomery
Fairfield, Connecticut

Ted Williams responds: Having enjoyed my articles "for years," one might have supposed that Mr. Montgomery would permit me one contrary opinion on his "sport" of shooting pheasants hand-tossed from towers and one desperate lunge for new material that "overstates the extent of the illegal [feather] trade." However, before he shreds another renewal notice, I urge him to read my piece more carefully, this time noticing the following sentence: "The lack of any paper trail makes it impossible to measure the size of the black market." Apparently Mr. Montgomery believes that people should not know about the problem until it is as critical as, say, high-seas salmon piracy by Danish drift netters. As I wrote, "We fly-tying anglers are much too pompous to think of ourselves as hypocritical."

We welcome letters from readers.
Address letters to: The Editors,
Living Bird, 159 Sapsucker Woods
Road, Ithaca, New York 14850.

BirdNews

American redstart by Herbert Clarke

BUILDING A BETTER POINT COUNT

Ornithologists have long recognized that "playbacks" are a useful tool for censusing birds on summer breeding grounds. Territorial birds will come to investigate, thinking that the tape recording is an intruder. Recently, Alexander Sliwa and Thomas Sherry of Tulane University put playbacks to a novel use: they played breeding season songs to census two migratory species—American redstart and black-throated blue warbler—on their neotropical *wintering* grounds. Both species are territorial in the winter as well as the breeding season.

Working on the island of Jamaica, the researchers conducted 581 point counts, recording all the species and individuals seen or heard at each point during a 10-minute period. After each count, however, they played redstart and black-throated blue warbler songs and chip notes that had been recorded in North America.

Sliwa and Sherry detected significantly more birds with playback than with conventional point counts: three times as many redstarts and twice as many black-throated blue warblers. The birds also came close, making it possible to determine their age and sex from plumage patterns, without having to trap them. And whereas point counts work best early in the day, when birds are most active, with playback the researchers could detect birds at other times of day. Finally, the recordings attracted not just the target species but several others. Thus playback-enhanced point counts offer many advantages over standard point counts.

HEAR ME SCREAM

Even in a room full of howling babies, most human parents can recognize their own infant's cries. Recently, Marthaleah Chaiken of Rutgers University showed that European starlings also respond to the distress screams of their own offspring. Her work appears in the journal *Behaviour* (Vol. 120:140-50;1992).

Working at a colony of about 100 birds, Chaiken placed camouflaged speakers near active nests. Then she broadcast prerecorded screams—either those of the birds' own offspring or the cries of unrelated chicks—and watched the parents react.

Starlings reacted dramatically to their own chicks. They often dived at the loudspeaker, sometimes making snarling calls. Birds who heard a neighbor chick's cries, on the other hand, typically continued to feed their own young, apparently unperturbed.

When she examined spectrograms of the screams, Chaiken found that each chick's cries had distinctive acoustic features. Although other studies have shown that parent birds can recognize their chicks' distinctive begging and contact calls, this is the first time that individuality in distress screams has been demonstrated in birds.

SPERM STORAGE IN SANDPIPERS

A male bird may guard his mate closely to prevent other males from fertilizing the eggs she is about to lay. But no matter how carefully a male spotted sandpiper keeps watch, he still can be cuckolded—by a bird that copulated with his mate weeks before.

Lewis Oring of the University of Nevada and three colleagues recently discovered that female spotted sandpipers can store sperm for as long as a month. In this species sex roles are reversed, and a female may pair with four different males over the course of the breeding season, leaving each one to incubate and rear the clutch she has laid for him.

The researchers used DNA fingerprinting techniques to examine blood samples from 111 sandpiper chicks. In five cases they concluded that the chick's father was neither the incubating bird nor a neighbor; the evidence pointed to one of the mother's earlier mates.

This finding suggests an explanation for a previously puzzling aspect of sandpiper breeding behavior. Some males arrive on the breeding ground earlier than others, even though no reproductive benefit could be measured. This study indicates that early birds may father more offspring—which the late arrivals end up raising.

CELEBRATE MIGRATORY BIRD DAY

The Smithsonian Institution has proclaimed May 8, 1993, to be International Migratory Bird Day, and birders throughout the Western Hemisphere are invited to participate. The event will provide a platform for conservation efforts already under way through Partners in Flight—Aves de las Americas. Individuals and organizations are planning a host of activities, including educational displays, bird counts and birdathons, events for children, and habitat enhancement projects.

Want to get involved? The *Migratory Bird Handbook*, full of ideas for projects and activities, is available for $5.00 postpaid from Jamie Doyle, Bird Conservation Specialist, Smithsonian Migratory Bird Center, National Zoological Park, Washington, DC 20008. (202) 673-4908

COMPILED BY CYNTHIA BERGER

Flying Field

AN ENTERPRISE OF THE SPIRIT

by Justin Carisio

Lab members share the mystical experiences that brought them to birding

There are in our existence spots of time,
That with distinct pre-eminence retain
A renovating virtue, whence, depressed
By false opinion and contentious thought,
Or aught of heavier or more deadly weight,
In trivial occupations, and the round
Of ordinary intercourse, our minds
Are nourished and invisibly repaired. . . .
William Wordsworth
The Prelude: Book XII

I approach natural history from a poetic perspective, and I have often reflected on the idea of the birder's life list as a "found" poem, in which each line has the power to conjure for its author riveting life events and magical places. When I see the word "osprey," for example, I am carried to a raw autumn dusk on Hawk Mountain's North Lookout 17 years ago when the last bird of the day came floating over the far hill low into shadow and then up until its white belly caught the setting sun behind us and burst into gold.

My experience with the osprey was the moment in which my walk through the world became bound up with birds. I cannot imagine the life of my mind being what it is had I not met that osprey on Hawk Mountain.

Many people experience comparable moments. These "spots of time" seal our connection with birds or touch us in such deep ways that birding becomes—perhaps without our knowing it—an attempt to renew an emotion or mystical sensation. I call these moments "primal bird experiences." Rehearsed in the mind's eye, they exert a mixture of calm and exhilaration—Wordsworth's "renovating virtue"—for the rest of our lives.

Unless a birder is compulsively clinical or blindly acquisitive, some mystical association must attach to many birds on his or her life list, but particularly to the initial experiences that begin a lifelong attachment to birding. These experiences give special meaning to the expression, "life bird."

Is there an archetypal character to primal bird experiences? Do birds draw people into relationships time and again in the same way? Or is each such experience accidental and haphazard? I intuit that birding begins as more than a kind of biological stamp collecting. It is for some people an enterprise of the spirit, and certain characteristics are common to primal experiences.

Last year an opportunity came to explore my intuitions. Cornell Lab of Ornithology general director Scott Sutcliffe, in an imaginative effort to spur the generosity of the Lab's supporters, sent out a fund-raising letter in which he shared his own primal bird experience and encouraged friends of the Lab to tell him theirs. I said to Scott that we ought to see what we could learn from this self-selected sample, and he graciously sent me the responses—all 300 of them.

What did they show? First, the unexpected. At least 125 respondents, the largest group in the sample, did not point to interactions with birds but to relationships with people as the experience that brought them to birding.

Pamela T. Marbold remembers staying at her grandmother's house. "She had a platform feeder outside the kitchen window. While we ate breakfast she taught us the birds." The idea of birding as a memorializing activity is poignantly stated by James A. Helmer, who remembers birding with his mother at a very early age. "She kindled an interest," Helmer writes, "that has grown in scope and passion. Although I also lost her when I was young, every time I spot a new or a well-known bird, I remember and thank her for nurturing my fondness for bird watching." Several writers took up birding to have something to share with a new spouse who was already hooked. Anne Bayless, for instance, went on her first bird walk with her new husband, who, it turns out, had ingeniously decided to take up birds to have something in common with Anne's mother.

Some respondents were drawn to birding by contact with the great names in birding. Arthur Allen, the Lab's first director, generated strong reminiscences. Elizabeth F. Washburn remembers that on one bird walk with Dr. Allen, "He casually remarked that on the lowest limb of the large maple just around the next bend in the trail there would be a prothonotary warbler—and there it was! On another occasion, Dr. Allen stopped the whole group, crouched by a little boy, and expounded on the robin a few yards ahead. I wonder if the child remembers this occasion, so typical of Dr. Allen."

I think the child does remember—even when the birder is not a legendary figure. Herman W. Coolidge recalls, "Back in the 1920s the 'Audubon Lady' would visit our rural grammar school and talk about birds." Willard Smith has similar memories of Saturday mornings in 1938, when he was an 11-year-old Boy Scout. "Mr. Howell, a dedicated, patient, and precise man, led our walks. Seeing a killdeer chick hatch, finding a grasshopper sparrow nest, and catching a bank swallow in an old hat—these were the beginnings of a lifelong love affair with nature."

Thus for many, the primal bird experience is a primal *birding* experience such as watching a feeder with a parent or grandparent or encountering a birding luminary. I doubt that we could overstate the variety or significance of these mentoring experiences as wellsprings of emotion and memory.

The second largest group of respondents described what I call species-specific experiences: compelling observations of a single bird or species. This is the kind of story I anticipated, and I was not disappointed.

The fascinating aspect of this group is that any bird will do. More than 80 species were mentioned! The diversity of the list is impressive, from robins and black-capped chickadees to tufted puffins and Leach's storm-petrels.

I was struck by the deep impressions left by the encounters. Jim Crusinberry wrote, "As a young man, I often spent the morning hours before work in the woods near my home. One morning, I decided to remain near the edge of an open field and just observe for a while. I had not been there long before three small bluebirds flew into a bush ten feet ahead of me. They stayed there for only a few seconds, and then were gone. I shall never forget the genuine surprise and joy I felt in those few quiet seconds." Joan Waldbaum reflected on seeing a red-winged blackbird when she was five years old. "I can still remember how beautiful I thought it was. It is one of those special memories I can bring back to mind when I need to 'center' myself." Says Mary Thorpe Parker, "My parents taught me to appreciate the natural world at an early age. My first 'communion' with a bird was with a scissor-tailed flycatcher when I was ten years old."

Eastern bluebird by Paul Zimmerman

Surprise, proximity, and visual impact lead to joy, a lifelong centering experience, and communion. But do the specific accounts have anything in common that would shed light on the nature of primal bird experiences? I think they do.

First, there is typically an element of surprise. The bird comes out of nowhere, a flash of color, a movement that materializes before the observer. The observer is caught off guard and a strong impression is made. This seems especially profound in young people. Consider Marc Demers's reflection, which has an almost Romantic innocence about it: "I was five years old and we were playing hide-and-seek in the forest near our houses. It was fall and the sight of a blue jay over the colorful leaves was my start!"

Second, these experiences are sensory. Sight is the most common sense engaged, but tactile sensation—actually touching a bird—appears to be even more intense. F. G. Johnson remembers, "A red-winged blackbird flew to my hand during a walk in a park many years ago. It gave me a feeling for birds I had never known before." Bird song, curiously, was not mentioned as frequently as I expected, despite its importance in birding.

Third, the accounts of primal bird experiences appear more mystical than aesthetic or technical. The focus is not merely on the beauty of the bird, but on a feeling of spiritual connection or an experience of peace and awe. Writes Charlotte Wenger, "When I was twelve years old, I saw my first great horned owl in a wooded area near my suburban home. I remember the awe I felt when it turned those huge eyes on me and flew a short way on those silent wings. I was able to follow the owl a second time before it flew away, but the memory follows me forever."

Finally, the bird often represents a preternatural reality. It belongs to nature, but in that radical moment transcends the merely natural. It is unique, individualized—almost personalized. The bird is perceived not unlike the self: fragile, warm, vocal, erratic; here one moment and gone the next. It may be that we recognize, at a level deeper than thought, a fellow traveler. Patricia Kiewicz remembers "ducking into some pines to shelter from the wind between classes at Michigan State University. I was face to face with a little green bird who flashed a red crest. I *had* to know what it was!"

After examining these accounts by Lab members, I think there is much left to study. For instance, one set of responses dealt with primal bird experiences that occurred during periods of sickness or grieving. I hope to learn more from birders generous enough to offer their experiences for consideration.

Of this I am confident: analysis of the phenomenon will bring me again and again to those rifts in daily life when, without warning, a bird suddenly appears in a special light before the struck gaze of the observer, and everything, in an instant, is seen with a new and exquisite grace. We know a great deal of what birding tells us about birds and their natural history. Perhaps much of what birding has to tell us about ourselves remains to be discovered. ■

Justin Carisio is a poet, executive writer for Du Pont, and member of the administrative board of the Cornell Lab of Ornithology.

PROJECT TANAGER

by Rick Bonney

Volunteers gather vital data on nesting tanagers

The scarlet tanager was not the first bird that I identified by myself. It was, however, the first one that took away my breath. I was standing at the edge of Cook's Canyon at the Wildwood Nature Camp in Barre, Massachusetts, when the bird popped into view. It was 50 feet away in the top of a tall tree, but since the tree was rooted in the side of the canyon, the bird was at the same level as my 10-year-old eyes. Even without binoculars the tanager's red-and-black brilliance left no doubt about its identity.

Ever since that day the scarlet tanager has been one of my favorite birds. I think it's the prettiest bird in North America, and I'm thrilled each time I see one.

Unfortunately, around my home in Upstate New York, scarlet tanagers seem to be declining. And data from the Breeding Bird Survey (BBS), the volunteer bird-counting effort conducted by about 2,500 birders each June, corroborates my concern: from 1978 to 1987, the scarlet tanager declined an average of 1.2 percent per year along BBS routes in the East.

True, that's not a huge decrease. But if you've been tuned into birds the last few years you've probably noticed that the dawn chorus seems a tad quieter each spring. In fact, the BBS suggests that more than half of eastern migratory birds showed declining populations during the last decade.

What's behind the apparent declines? Often-cited causes are deforestation of tropical wintering grounds and destruction of habitat along migratory corridors—but there's another possibility.

Many of the birds that seem to be declining are "forest interior specialists." This group includes dozens of familiar songbirds, including warblers, vireos, and thrushes, which require large tracts of land for successful breeding. Could these birds be declining because the large forests on which they depend are being chopped into smaller blocks by roads, logging practices, agriculture, and urbanization—a process called forest fragmentation?

Ornithologists suspect that fragmentation of forests harms woodland birds by increasing their susceptibility to predation and nest parasitism. Predators such as jays, crows, raccoons, and cats, as well as the parasitic brown-headed cowbird, are usually found in disturbed, open habitats. But if a forest is dissected by roads or power line cuts, then predators and cowbirds can penetrate the woodland with ease.

Arthur C. Smith III from Grant Heilman Photography

How much forested land do these scarlet tanagers need to raise their brood? Help us find out.

Unfortunately for forest-dwelling birds, fragmentation is pervasive throughout most of the United States. Housing developments carve up once-continuous woodlands. Logging operations punch roads into previously undisturbed forests. And wildlife biologists have traditionally promoted forest fragmentation because of perceived benefits to game species that thrive on habitat edges.

During the past 15 years, the importance of large areas of continuous forest for maintaining forest-interior specialists has been demonstrated in the eastern United States. The work of U.S. Fish and Wildlife Service biologist Chandler S. Robbins, in particular, has documented the habitat area requirements of forest birds breeding in the middle Atlantic States. In a paper published in 1989, Robbins and his colleagues concluded that an observer had the best chance of finding most forest-nesting neotropical migrants in very large forests.

Nevertheless, the value of continuous forest is not completely proven. One reason is that few studies of the area required by forest birds have been conducted outside of the East. In addition, some ornithologists remain unconvinced that forest fragmentation is a problem for woodland birds anywhere. The reason for declining species, they believe, is simply natural changes in vegetation. Research is therefore needed to confirm the importance of continuous forests in the eastern United States and to determine whether large forests are equally important elsewhere.

That's why the Cornell Lab of Ornithology has started Project Tanager. With funding from the National Science Foundation and the National Fish and Wildlife Foundation, we are developing a National Science Experiment that will determine the size of forest required for successful breeding by each of the four species of North American tanagers—the scarlet tanager in the Northeast; the summer tanager in the South; the western tanager in the West; and the hepatic tanager in Arizona and New Mexico. For this experiment we have identified the following hypotheses: All four species of North American tanagers will be more likely to occur and will be more likely to breed successfully in larger patches of forest than in smaller ones.

Why study tanagers? First, all four species are neotropical migrants that could be sensitive to forest fragmentation. Robbins's data suggest that both scarlet and summer tanagers are most likely to be encountered in forests of 3,000 hectares or larger. Second, most areas within the 48 contiguous states are inside the breeding range of at least one of the four species. Finally, for a study involving large numbers of participants, tanagers are a good subject because they are relatively conspicuous and fairly easy to identify both by sight and by sound.

And speaking of large numbers of participants—if you're an active birder, this means you!

What's involved? As a Project Tanager participant, you will select census points in forests of different sizes, then visit each point during the breeding season to search for tanagers and for evidence of successful nesting.

If you have a limited amount of time, you can participate by visiting at least five census points in a small or medium forest and at least five points in a large forest. You should be able to accomplish this with just a couple days' effort. If you have more time or more observers, you can conduct a complete study of 32 to 40 points: eight in each of four forest sizes—small, medium, large, and continuous—plus extra points in the small fragments.

Once your points are selected, you will fill out a simple form to describe the habitat of each. Next, you will visit each census point twice, with about one month between visits. On the first visit you'll look for tanagers until you see or hear one or until 10 minutes have elapsed. On the second visit, you'll follow any tanagers you find to look for evidence of breeding.

Once you collect your data you'll record them on computer-readable forms and send them to the Lab of Ornithology. Lab staffers will then analyze your data, report the findings to you and other participants, and distribute the results to cooperating organizations and the media. We will also publish the results in scientific journals.

Sound complicated? We won't pretend it's simple, but we can suggest ways to make it easier.

First, we encourage bird clubs to tackle Project Tanager in teams, multiplying brain power and shortening the time commitment. Four teams, for example, should be able to cover 32 points in one day.

Also, Lab staffers have already started working with land managers, such as biologists with the U.S. Forest Service and various state agencies, to identify study sites around the country. In many areas we should be able to identify census points for participants.

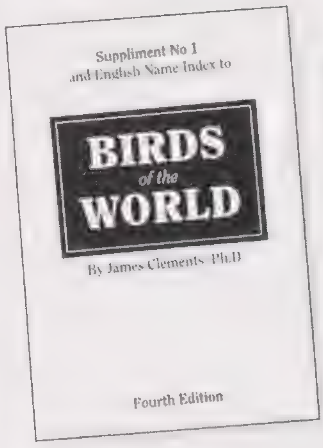
Should you choose to participate, you'll receive a kit with detailed instructions for identifying study sites, conducting the experiment, and filling out the data forms. The kit also will include full-color illustrations of both males and females of each species of tanager, species accounts including habitat requirements and field identification tips, and a cassette tape of tanager songs and calls. The tape also will include songs and calls of other birds that sound similar to tanagers. You will use the tape to become intimately familiar with tanager vocalizations. You'll also use it in the field, to lure skulking tanagers into sight.

We're not sure what the results of Project Tanager will be. If we did know, the project would not be an experiment. But whether our hypotheses are confirmed or rejected, the information we collect will help land managers to develop plans that address the habitat needs of migratory songbirds.

The Lab of Ornithology invites you to join this historic research endeavor! ■

For more information write or call: Mindy Westgate, Project Tanager, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850. (607) 254-2446

BIRDS of the WORLD
A CHECK LIST
James F. Clements



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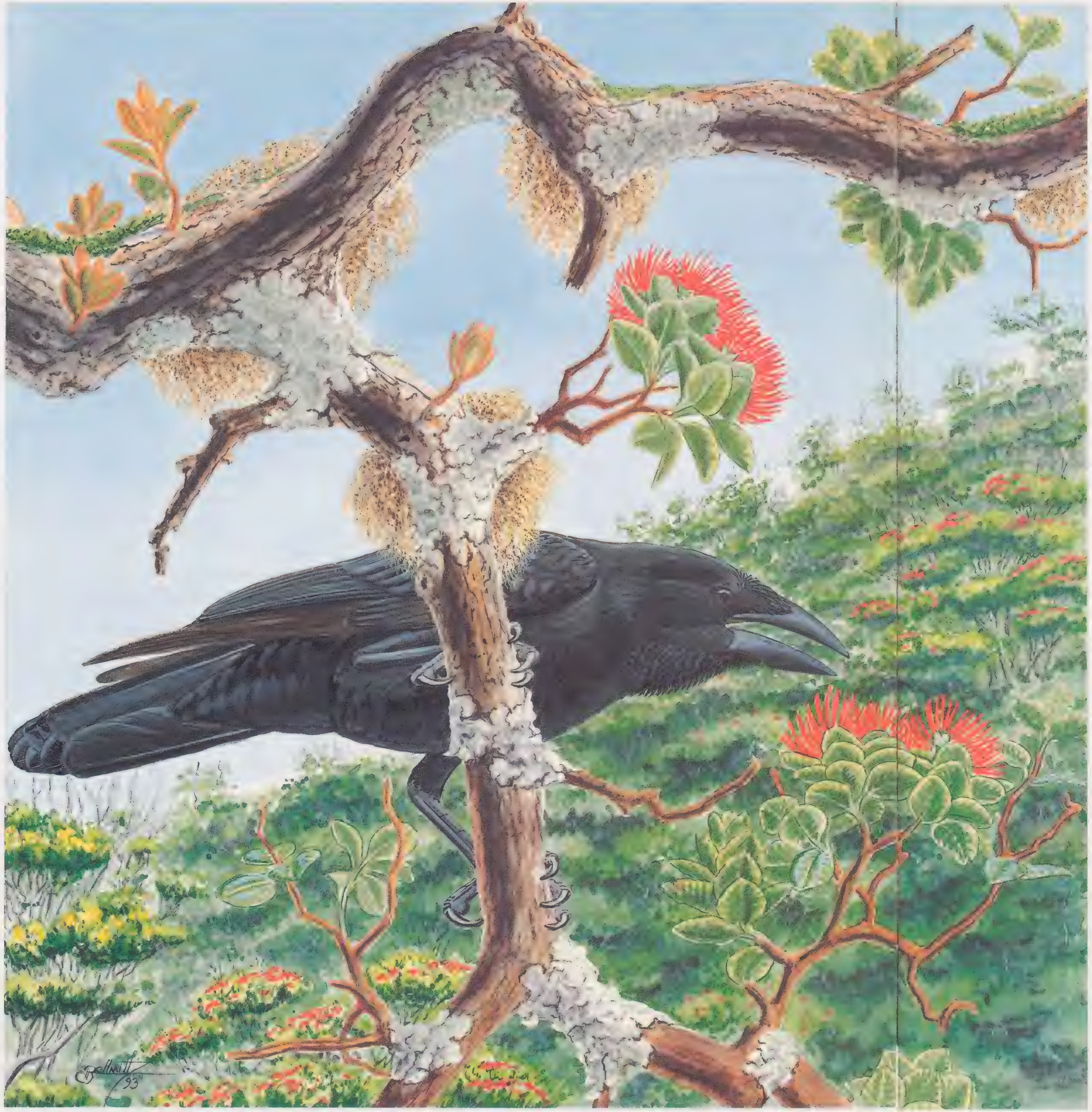

ILLUSTRATION BY JOHN SCHMITT

Trouble in Paradise

by Mark J. Rauzon

With less than a dozen pairs left, time may be running out for the Hawaiian crow

Is there enough *aloha* (goodwill) to save the *'alala*? Until recently, the prospects for the endangered Hawaiian crow looked bleak. Scientists believed that the 11 birds held in a captive breeding facility made up virtually the entire world population of this gregarious species. Then, last spring, biologists found that 12 birds still exist in the wild, raising hopes that an immediate infusion of new genetic material could boost the success of the captive breeding program. Capturing the last wild crows, however, pits public interests against private ownership, and the 'alala's future is uncertain.

How did a bird that was once common on the island of Hawaii come to the verge of extinction? Unlike many Hawaiian birds, the crow survived the deforestation, diseases, and other ravages that arrived with Polynesian and European settlers. The 'alala, whose name means "rise up with the sun," remained relatively abundant throughout much of its original range, the Kona coast on the big island of Hawaii, well into the 20th century.

But like most crows, the 'alala was considered a pest and shot by hunters. Extensive forest clearing in the 1920s caused a serious decline in the population. Low reproductive success, disease, and predation also played a part in the bird's decline. By 1931, the 'alala was restricted to a few isolated locations and was placed on the Territory of Hawaii's protected bird list. Protection on paper was little help, as forest fires and logging further reduced and fragmented the remaining populations. In 1967, when only about 100 crows were left, the U.S. Fish and Wildlife Service (USFWS) listed the 'alala as endangered.

By 1983 the wild population had declined to between five and fifteen crows in three isolated groups. Biologists who conducted the annual 'alala survey in 1986 spent the equivalent of 84 person-days searching without finding a single crow in the count area. The result was the same in 1987. Although researchers believed that a few crows still survived on private property, the 'alala was all but extinct in the wild.

During the 1970s the Hawaii Department of Land and Natural Resources had brought a few Hawaiian crows into captivity, but these birds fared no better than their wild cousins. For 10 years, they languished in what amounted to a detention center at the state Endangered Species Captive Propagation Facility in Pohakuloa. Rats and disease ran rampant at the facility, while maintenance and husbandry positions went unstaffed due to a shortage of funds. What's more, the facility lay adjacent to a U.S. Army bombing range. Hawaiian crows are extremely sensitive to disturbance while nesting, and the periodic explosions prevented them from reproducing.

In 1986 the Army agreed to curtail military activities during peak laying periods. The following year four pairs courted, but only one pair laid eggs. The two-egg clutch did not hatch, however, and when the pair renested, the female died from a growth in her oviduct.

Meanwhile, Hawaiian environmentalists were battling with state and federal agencies on behalf of the remaining wild crows. For years they had begged the state to investigate cattle ranchers who held state leases in prime crow habitat. But state officials ignored allegations of crow shooting and habitat destruction, and the researchers'

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FERN P. DUVALL II (2)

requests to survey private property where the crows might be nesting were denied. Environmentalists charged that the USFWS was "writing off" the crow as a lost cause to avoid jeopardizing other endangered species projects in Hawaii.

Genuine efforts to save the crows finally got under way in late 1986 when the governor of Hawaii authorized the relocation of the captive breeding facility. The birds were moved from the bombing range on Hawaii into a vacant low-security prison on the island of Maui. The state contributed over $100,000 to facilitate the move, while the USFWS contributed funds through the Endangered Species and Pittman-Robertson acts and the Army provided manpower to construct new aviaries and support facilities.

The state also hired consultant Fern P. Duvall II to develop better techniques for breeding Hawaiian crows. At the new facility, Duvall split up the pairs of crows and assigned them new mates. When the new pairs were brought together in 1988, they exhibited normal reproductive behavior for the first time in five years. Three of the four pairs courted and two eventually laid eggs.

When Duvall moved the spotted, blue-green eggs to an incubator, both pairs laid second clutches. Two eggs in one of the first clutches appeared to be developing normally in the incubator, but they did not hatch after the 20-day incubation period, even though an autopsy revealed fully formed embryos in the shells.

Duvall examined the literature and reviewed his experience in breeding four other crow species. He concluded that the incubator was too cool. For years, the captive breeding program had been maintaining eggs at a temperature that prolonged incubation to 22 days, producing embryos too weak to crack out of the shell. Duvall moved an egg from one of the second clutches to a different incubator and increased the temperature by a fraction of a degree. With this slight modification, a strong chick hatched after 20 days. The chick was named Ho'oku, which means "to continue [in the perpetuation of a lineage]" in Hawaiian.

This success raised hopes for the 1989 breeding season. One egg hatched from the first clutch laid, and the healthy chick was named Ho'ike, or "righteousness." But celebration was followed by tragedy just hours after the chick hatched, when an inattentive employee walked through the off-limits area of the facility and frightened Ho'ike's parents as they were laying a second clutch. The upset male destroyed one egg, and the other two eggs ultimately did not hatch.

This setback spurred the development of new techniques to provide the crows with privacy. The cages were isolated and monitored by remote video. As a result of these changes, one chick fledged in 1990, and another in 1992. Eleven crows now exist in captivity.

The success at the new facility is encouraging. But one other problem has plagued the captive breeding program since its inception—the lack of genetic variability. All of the male crows in the captive flock are related to one another. The younger females are mating with their fathers, grandfathers, cousins, or uncles. Says Duvall, "Because of the very limited genetic composition of the flock, egg normalcy and hatchability are very poor." Of the 80 eggs laid from 1979 to 1992, only seven chicks have survived. "It makes no sense to do what we do, at the cost we do it for, if no new genetic material is secured," says Duvall. "It is critical to capture some of the last wild crows for the captive breeding program."

The road to recovery winds through the McCandless Ranch—and here too lies a roadblock. The ranch sprawls over 150 square miles up the Kona slopes of Mauna Loa, prime 'alala habitat. Scientists believed that as crow populations declined, the highly social birds flocked to this refuge. It is here, they thought, that the last wild crows lived.

But for 10 years, no one knew for sure. Ranch manager Cynthia Salley denied government biologists access to the land to survey the crows. She charged that when a former state biologist surveyed crows on the ranch years ago, he caused the birds to abandon their nests. Pointing to the past failures in the captive breeding program, Salley claimed the crows were reproducing just fine on the ranch, where they were protected from meddling biologists.

Dana Kokubun of the Hawaii Audubon Society says that the ranch wouldn't allow biologists on its property because of the risk that "selective" logging—which some believe was destroying crow nest sites—could be curtailed as a result. She says the Audubon Society tried virtually everything to get permission to enter the property. Entreaties to get the USFWS to act went unheeded. Said Kokubun, "The crows won't stand another decade of neglect. That's why we decided to sue USFWS."

The Sierra Club Legal Defense Fund represented the Hawaii Audubon Society and the National Audubon Society in their suit against the USFWS; the McCandless Ranch was named as an indispensable party. The suit contended that the USFWS is required to enforce the Endangered Species Act and to implement recovery plans for the crow. It also charged that the implied intent of the act is to grant the authority to enter private property, if this will enable the USFWS to fulfill its statutory duty. USFWS representatives countered that they had repeatedly tried to gain access to the ranch to census the crows but were denied permission. They said that they had no legal authority to enter private property over the objections of the landowner because the Constitution protects citizens against illegal search and seizure of private property.

The U.S. District Judge disagreed with this argument and granted an interim settlement on April 3, 1992, that permitted the USFWS to conduct an 'alala census on the McCandless Ranch. On April 11, after more than a decade of denial, USFWS biologists surveyed the property and found 11 wild Hawaiian crows—five pairs and one unattached individual. They also located another crow off the ranch.

Twenty-three crows—11 in captivity and 12 in the wild—make a limited and very vulnerable gene pool. The captive flock is one big family. The genetic composition of the wild flock is unknown, and another hurricane like last autumn's Iniki could wipe it out. Duvall and Kokubun feel that the best and last hope for the 'alala is to unite the captive and wild flocks and increase genetic diversity in the captive breeding program. Duvall is already working with a crow specialist from the Houston Zoo and an avian veterinarian to make the necessary preparations.

A handful of captive Hawaiian crows languished for years, their breeding disrupted by the noise from an adjacent Army bombing range. When the birds were relocated to a new, more peaceful facility, left, on the island of Maui and assigned new mates, they finally showed normal breeding behavior. The result, above, a healthy chick.

Meanwhile, the USFWS asked the National Academy of Sciences (NAS) to assemble a committee to evaluate the situation and recommend a course of action. The NAS concluded that the wild birds might not add much genetic variation to the captive flock; the captive birds were taken from an area not far from the McCandless ranch, so the two groups are probably related. But the committee did recommend that researchers be allowed to take the first clutch of eggs from wild nests each spring to add to the captive flock.

Now the parties to the lawsuit are trying to reach a settlement. If biological needs can surmount legal constraints, and if new crows are added to the captive flock, then perhaps someday offspring can be released to the wild. Then, as its Hawaiian name prophesies, the 'alala will rise up with the sun once again in this land of *aloha.* ■

Mark Rauzon is an environmental writer, photographer, and illustrator of children's science books.

The POLITICS of PROTECTION

Before housing developments and cattle grazing disturbed this tract of coastal sage scrub near the Chino Hills, above, the habitat supported endangered California gnatcatchers. A male gnatcatcher, right, wears a U.S. Fish and Wildlife Service band, but the habitat he depends on receives no official protection from the federal agency.

Can the building industry's "worst enemy" hang on in Southern California?

by Jonathan L. Atwood
Photographs by Bruce Farnsworth

A firestorm of controversy has erupted around the California gnatcatcher, a small, gray bird that has been proposed for listing under the Endangered Species Act. The Southern California building industry calls this 6-gram songbird its "worst enemy," and warns that protecting the gnatcatcher will bring "economic meltdown."

Yet before 1989, few people had even heard of a California gnatcatcher. That was the year the American Ornithologists' Union (AOU) Check-list Committee accepted the results of my doctoral dissertation. My research showed that what had formerly been considered one species of gnatcatcher was actually two—the California gnatcatcher (*Polioptila californica*),

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found in coastal Southern California and most of Baja California, and the black-tailed gnatcatcher (*Polioptila melanura*), which lives in the Sonoran and Chihuahuan deserts of Mexico and the southwestern United States. Although they look almost identical, the two species sing markedly different songs and, as a result, don't interbreed.

At the time I considered the results of my research to be a somewhat esoteric addition to the body of knowledge we call science. Who cares that there are two species of gnatcatchers with mostly black tails? As far as I could see, the prime value of my dissertation was that birders could add a new species to their life lists. In fact, I was amused at how often I was thanked for helping someone "check off" the California gnatcatcher. I was wholly unprepared for the conservation battle my findings would spark.

Will children hear the songbird sing in the year 2010?
SAVE the CALIFORNIA GNATCATCHER from EXTINCTION
TOLL ROAD

When the California Fish and Game Commission voted against adding the gnatcatcher to the state endangered species list, "citizen watchdogs" stepped into the breach. Above, in Orange County, conservationists rallied to oppose construction of a toll road through prime gnatcatcher habitat. The ultimate solution, gnatcatcher supporters say, is a network of reserves protecting all species that rely on the unique habitat. At right, a starting point—the National Audubon Society's Starr Ranch Sanctuary.

Like many endangered species throughout the world, the California gnatcatcher is a sedentary ecological specialist, restricted to a geographically limited habitat and competing with a burgeoning human population. Within the narrow strip of coastal lowland between Los Angeles and San Diego, the approximately 2,000 pairs of California gnatcatchers that remain in the United States are being squeezed out of existence by a human population of more than 15 million. U.S. Census Bureau data show that 4 of the 10 fastest-growing major cities in the United States are located in areas of coastal Southern California that support—or did support—gnatcatchers. Property values in this region—especially for land that has an unobstructed view of the Pacific and is within commuting distance of major business centers—often approach $250,000 per acre. Considering that the home range of a single pair of gnatcatchers may exceed 20 acres, the financial implications of this issue make the northern spotted owl conflict in the Pacific Northwest look like a "pre-season warm-up game," to use the development industry's assessment.

Some who are opposed to listing the gnatcatcher argue that the bird doesn't require protection in the United States because it is abundant in Mexico. Ornithologists, however, consider the gnatcatcher that occurs in coastal Southern California and northwestern Baja California to be a different subspecies from those that occur in central and southern Baja California. This northernmost, nominate subspecies is the bird that is proposed for endangered species listing, and it is threatened in both countries. The intense agricultural and urban development currently occurring in the border region of Mexico closely resembles the type of "progress" that characterized coastal Southern California in the years following World War II. The human population of northern Baja California already exceeds that of San Diego County in California. Because no effective regulations exist to control land use in Mexico, the status of the California gnatcatcher's nominate subspecies must be considered tenuous throughout its range.

Like the spotted owl, the California gnatcatcher represents an entire ecosystem that is threatened with extinction. But the coastal sage scrub community, although rich and varied in its biodiversity, has been overlooked for many years by conservationists. In large part this is because at first glance, coastal sage scrub is a decidedly "uncharismatic" habitat—it lacks the aesthetic appeal of an ancient forest. During most of the year, hillsides appear to be covered by waist-high stands of dry, dusty "weeds." Only during the brief annual rainy period, when aromatic shrubs such as California sagebrush, white sage, and California buckwheat leaf out and flower, would the casual observer even notice what some plant ecologists consider one of the nation's most threatened vegetation types.

Recent studies indicate that in the United States approximately 70 to 90 percent of this once-widespread habitat has already been destroyed. The California gnatcatcher has not been the only species to suffer the consequences. Nearly 100 of the community's species, including cactus wrens, orange-throated whiptail lizards, Quino checkerspot butterflies, Pacific pocket mice, and slender-horned spineflowers, are considered rare, threatened, or endangered.

After I finished my Ph.D., I came to the Manomet Bird Observatory (MBO) in Massachusetts, where I work as a land bird biologist and endangered species specialist. In the fall of 1990, after examining recent distributional data, including projected threats to the remaining gnatcatcher populations, I concluded that the California gnatcatcher met the formal criteria for protection under the U.S. Endangered Species Act. In a jointly filed petition, MBO and the Natural Resources Defense Council (NRDC) asked the U.S. Fish and Wildlife Service (USFWS) to add *Polioptila californica californica*, the northernmost subspecies of the California gnatcatcher, to the federal list of endangered and threatened wildlife.

We knew that the wheels of government can be painfully slow in turning, and that no legal protec-

tion would be afforded to the gnatcatcher until the USFWS had made a final decision. So MBO and NRDC also asked the California Fish and Game Commission to grant protection to the species under California's State Endangered Species Act.

It was immediately obvious that opposition from the Southern California building industry would be intense. To promote public awareness of the need for scientifically driven regional land-use planning, MBO and the National Audubon Society helped local conservation groups form a coalition called the Endangered Habitats League (EHL). Under the leadership of EHL coordinator Dan Silver, conservationists organized to act as citizen watchdogs who would monitor development activities and advocate coastal sage scrub conservation before local planning commissions and in other public forums.

Eight months later the California Fish and Game Commission held formal hearings to decide whether to grant the gnatcatcher protection under state law. Nearly a thousand people packed an auditorium in Newport Beach for the emotion-charged hearing. The scientists who testified unanimously supported listing the gnatcatcher as endangered, citing critically low population levels, extensive habitat fragmentation, projected future loss of habitat, and the absence of effective regulatory mechanisms. They also cited behavioral studies that showed gnatcatchers were unlikely to colonize isolated patches of coastal sage scrub surrounded by extensive areas of urban development. Other studies showed that most gnatcatcher populations occurred at elevations below 250 meters, whereas most protected areas and parklands were at higher elevations. The EHL presented evidence from aerial surveys that some developers were making aggressive preemptive strikes against the gnatcatchers on their properties. Apparently they hoped to avoid future regulatory restriction by destroying the birds' habitat before legal protection could be granted.

The commission also heard from those who opposed listing the gnatcatcher. Considering that state law required the commission's decision to be based solely on biology, the extended testimony from attorneys for the Southern California building industry, many of whom admitted they knew nothing about gnatcatcher ecology, yet insisted that the bird should not be protected, was almost comical.

Almost. The Fish and Game Commission yielded to the lobbying efforts of the development industry, apparently as a result of political pressure. In September 1991, the commission voted not to advance the California gnatcatcher to endangered species candidacy. In a face-saving move, the state Resources Agency promised to implement a creative new land-use planning strategy, called Natural Communities Conservation Planning (NCCP), as rapidly as possible. This strategy would protect not only gnatcatchers but all of the threatened plants and animals that make up the coastal sage scrub ecosystem. The agency pledged strong interim controls on land development to guarantee that critical tracts of habitat would not be lost while land-use plans based on the tenets of modern conservation biology were being prepared.

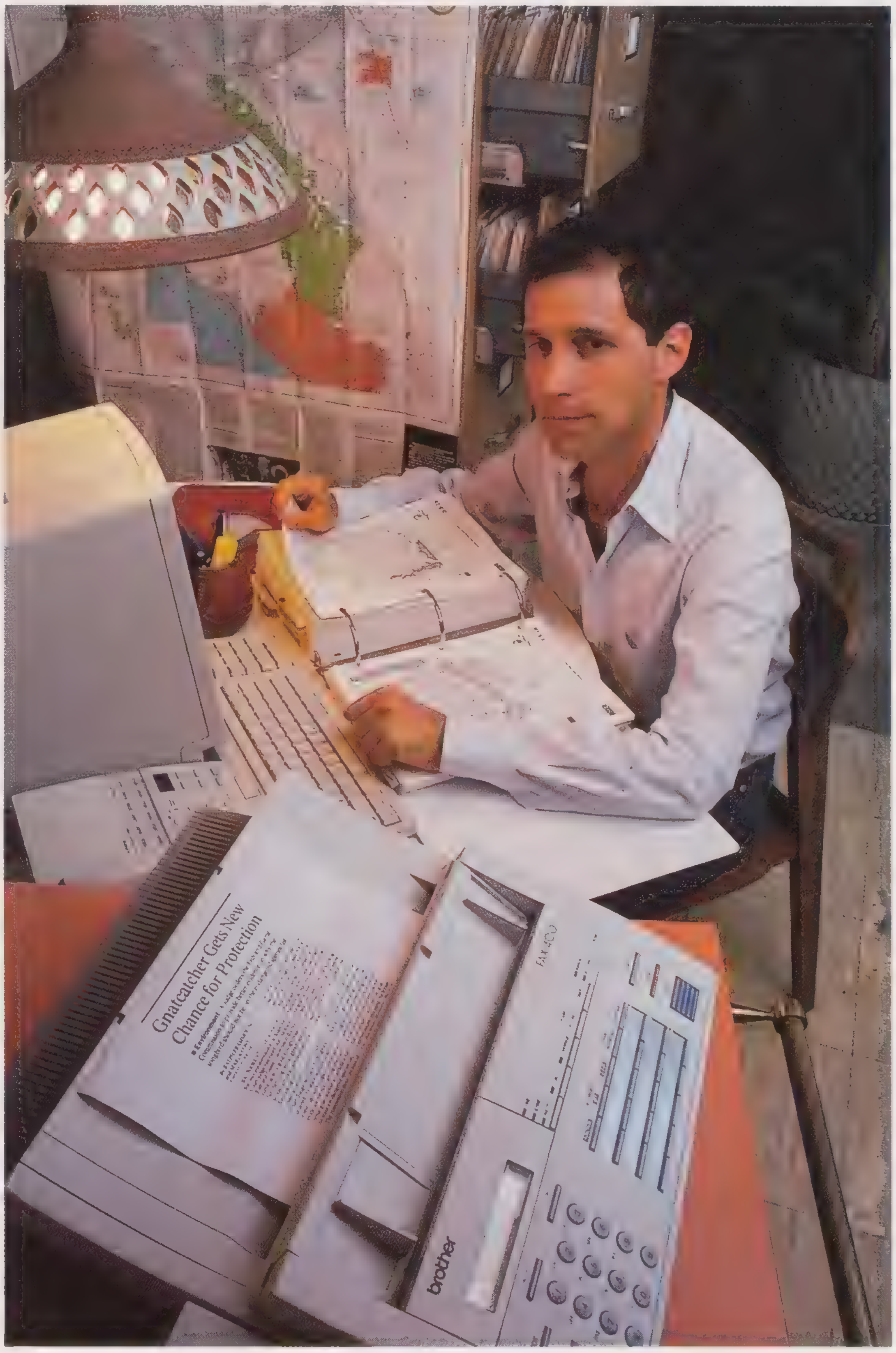
This approach to endangered species conflicts sounded like it might satisfy both developers and conservationists. Still, NCCP was only a promise, and conservationists were skeptical that the program would ever materialize. NRDC filed suit against the California Fish and Game Commission, charging that regardless of the merits of the NCCP proposal, the commission had failed to act according to the requirements of California's Endangered Species Act.

Weeks after the State of California decided that the California gnatcatcher was not in trouble, the USFWS came to the opposite conclusion. The agency proposed to list the gnatcatcher's northernmost subspecies as endangered under the federal Endangered Species Act. Although the USFWS supported the NCCP concept, the agency recognized the need to work within the framework of existing law instead of depending on vague promises made by politicians and bureaucrats. The USFWS proposal to list the gnatcatcher started a one-year public comment period, after which a final decision would be made. During the public comment period the gnatcatcher and its habitat would receive no legal protection.

In the following months, the State of California's NCCP program slowly evolved. None of the guaranteed protections against habitat loss that ostensibly justified the Fish and Game Commission's decision were put into place, however. The EHL reports that since August 1991 at least 2,000 acres of coastal sage scrub have been bulldozed without adequate mitigation measures. Meanwhile the development permiting process has continued, setting in motion major growth-inducing projects that may be hard to stop even if the gnatcatcher is eventually granted legal protection.

As the NCCP program continued to founder, and as the September 17, 1992, deadline for a final decision from USFWS approached, conservationists won an important legal victory. Judge William R. Ridgeway of the California Superior Court agreed with the NRDC's suit against the State Fish and Game Commission, stating that the commission had given "no hint of the reasoning used or the evidence relied upon" to reject the gnatcatcher listing petition. Openly contemptuous of the findings that had been presented to justify the decision, Ridgeway required the commission to reconsider its action. Instead, the commission chose to appeal this ruling, and the gnatcatcher still has no protection under state law.

Meanwhile, at the federal level, when the September deadline arrived, Secretary of Interior



Construction of a toll road in Orange County, far left at the center of the photograph, has displaced four gnatcatcher pairs at this site, according to the USFWS. Below, news on the gnatcatcher ruling rolls off the FAX machine under the watchful eyes of Dan Silver, coordinator of the Endangered Habitats League—a grassroots effort to protect coastal sage scrub.

Manuel Lujan used his discretionary power to delay the final decision on the gnatcatcher for up to six months—not a surprising move, given the pressures of an election year. His ostensible reason for this action was that it would allow the USFWS to clarify the technical issue of subspecific taxonomy raised by the development industry. As was noted earlier, other subspecies of *Polioptila californica* occur in Mexico. Opponents to the gnatcatcher listing, especially the Chevron Land and Development Company, question the southern distributional limit of the subspecies that is proposed for listing, even though this limit has been accepted by ornithologists since 1926.

Days after Secretary Lujan extended the public comment period, Burt Monroe, chairman of the AOU Check-list Committee, wrote to the USFWS and confirmed that the range limit of *Polioptila californica californica* did not extend into central Baja California. With the concocted issue of subspecific taxonomy resolved, and with the NRDC threatening to sue the USFWS for its unwarranted mid-September delay in listing the gnatcatcher, conservationists are now optimistic that a final ruling in favor of listing may be imminent. The development industry has sued the USFWS over the taxonomy issue, however—even before a final decision has been made—and more lawsuits are sure to follow. Meanwhile coastal sage scrub—and gnatcatchers—continue to disappear from Southern California. The regulatory framework that would be provided by listing the gnatcatcher as endangered is badly needed to protect critical tracts of habitat.

Yet even in the absence of a listing decision, there are signs that this issue has already brought real progress to conservation efforts in many parts of Southern California. Conservationists say one weakness of endangered species legislation is that most laws tend to focus on a single species. As a result, the costly processes associated with listing decisions and preparation of recovery plans must be repeated again and again—straining limited financial resources and forcing some species onto the back burner as more charismatic animals or plants receive higher priority. The development industry also dislikes the species-by-species approach, fearing an endless succession of listing actions and litigation that cause expensive delays and cripple long-range planning. By focusing on multispecies, habitat-oriented conservation efforts, these two opposing sides may find enough common ground for a win-win scenario.

This is what seems to be happening in some areas. Anticipating that the gnatcatcher will eventually be protected under state or federal law, some local jurisdictions and major land developers are beginning to pursue multispecies, regional planning efforts aimed at creating a network of large coastal sage scrub reserves. This system of reserves and open space areas will protect not only gnatcatchers but a host of declining species that might otherwise languish for years on candidacy lists, waiting to be considered for formal endangered species protection.

These reserves are being designed based on the results

For author Jon Atwood, left, at Crystal Cove State Park in Orange County, an obscure change in taxonomy led to an unexpected conservation battle. Above, hope for the future: amid blooming California buckwheat, a male gnatcatcher takes his turn on the nest.

SPECIAL PULLOUT SECTION

BIRDSCOPE

The newsletter of the Cornell Laboratory of Ornithology ■ Volume 7, Number 2 ■ Spring 1993

Can Birds Coexist with Agriculture?

by Tim Gallagher

BPS study looks at nesting success

Birds that prefer agricultural habitats have declined at an alarming rate during the past 25 years, despite the U.S. ban on DDT and other organochlorine pesticides. Are the pesticide compounds currently in use no better than the ones they replaced, or are other factors at play in these declines? A recent study by Bird Population Studies (BPS) addressed these questions.

The study was initiated by the Avian Effects Dialogue Group (AEDG)—an advisory committee made up of Environmental Protection Agency (EPA) staff, environmentalists, and chemical industry representatives—and was designed to determine whether anticholinesterase pesticides are a significant factor in bird declines in agricultural areas.

Anticholinesterase pesticides attack a chemical that organisms need to process oxygen; insects that come in contact with these compounds in effect suffocate. These pesticides were developed to replace DDT, which was banned in the United States in 1973, and other organochlorine pesticides.

The problem with DDT, which had been in widespread use here from the end of World War II until the ban took effect, was that it stayed in the environment in a toxic form, becoming increasingly concentrated in the tissues of birds and animals as it moved up the food chain. In sufficient amounts DDT inhibited the production of calcium and caused some birds to lay thin-shelled, unviable eggs. Peregrine falcons and brown pelicans nearly became extinct in the United States as a result.

The main advantage to anticholinesterase insecticides is that they break down quickly in the environment. Birds that are not killed during the initial application of the chemical should recover without permanent damage. "The major problem is that these chemicals are not specific in their action," says BPS director Greg Butcher. "They work well on insects, but they can also affect birds and even humans." If the correct dosage of an anticholinesterase pesticide is applied, then only insects should be affected, but this ideal situation may not always be achieved.

"The AEDG came to the Lab and asked us to look specifically at the effect of these chemicals on the nesting success of birds in agricultural habitats," says Butcher. To accomplish the task, BPS staff used cards from the North American Nest Record Program, which the Lab has been running since 1963. More than 300,000 cards, with information on more than 550 species, have been collected since then. Volunteer nest-finders fill out cards that list the species, year, location, habitat, height from the ground, nest contents, and information on cowbird parasitism. The best cards show multiple visits to nests and chart progress through a season.

"We looked at a variety of species—killdeer, red-winged blackbird, mourning dove—14 in all," says Butcher. (See table below.) "We charted the general effects of agricultural practices on the nesting success of the birds from 1963 to the present—a time when the intensity of farming activity increased dramatically in this country and farmers switched from organochlorine to anticholinesterase pesticides."

The study produced somewhat disparate results. Although the success rates of individual nests in agricultural habitats have been markedly higher in the past 20 years than they were during the DDT era, bird populations in agricultural areas have been declining dramatically. Could anticholinesterase pesticides have been killing birds before or after the nesting season?

(continued on page 2)

	All counties	*Corn*	*Alfalfa*	*Sorghum*	*Cotton*	*Populations declining 1966-1991?*
Ground Birds						
Ring-necked Pheasant	Yes	Yes	Yes	-	-	Yes
Northern Bobwhite	Yes	Yes	No	Yes	Yes	Yes
Killdeer	Yes	Yes	Yes	Yes	Yes	Yes
Horned lark	No	Yes	No	No	-	Yes
Vesper Sparrow	No	No	No	-	-	Yes
Savannah Sparrow	Yes	Yes	Yes	-	-	Yes
Eastern Meadowlark	Yes	Yes	Yes	-	-	Yes
Above Ground Birds						
Mourning Dove	Yes	Yes	Yes	No	Yes	No
Gray Catbird	Yes	Yes	Yes	-	-	Yes
Loggerhead Shrike	Yes	Yes	Yes	No	-	Yes
European Starling	No	Yes	Yes	-	-	Yes
Song Sparrow	Yes	Yes	Yes	-	-	Yes
Red-winged Blackbird	Yes	Yes	Yes	Yes	Yes	Yes
House Sparrow	Yes	Yes	Yes	-	-	Yes
Number of Yeses	11	13	11	3	4	13
Number of Nos	3	1	3	3	0	1

Was nesting success worse during the DDT era than it was in the post-DDT era in counties with this crop?

"That's certainly possible," says Butcher. "But pesticides are used most extensively just at the time when birds are raising their young. If the insecticides are directly killing a lot of birds, you should see a high mortality rate in nestlings. It's more likely that the birds are declining because there's less suitable habitat available for them."

Modern farming practices—planting monocultures, using large fields, and constantly striving for increasing crop yields—make farms much less hospitable places for birds than they once were. Herbicides and intensive cultivation eliminate weeds between the crop rows, which once provided food and cover for birds. Insecticides get rid of the insects, a major food source for many birds. In addition, larger field sizes result in fewer hedgerows, which means less cover and food for birds in agricultural areas.

"You have to look at farming in a unified way," says Butcher. "You can't just regulate one aspect, such as pesticide use, and expect to have a tremendous effect on the birds. When we tried to determine what aspect of modern farming was so detrimental to birds, it was impossible to pull out one factor or another." Larger fields, more equipment, more herbicides, more insecticides—all these things occur simultaneously and all are detrimental to birdlife.

"It's this whole economic push to increase the number of bushels per acre, this push toward growing monocultures, the whole suite of activities in combination that is harmful to birds," says Butcher. "Farms are becoming more like factories, designed to produce the basic commodities our society needs at the lowest cost."

But Butcher points with great hope to a recently initiated conservation reserve program that encourages farmers to leave marginal lands idle—especially wetlands and highly erodible lands. The U.S. Fish & Wildlife Service and others are studying birds in these areas. "It turns out that any time farmers let this land go idle, there's an immediate increase in the birds that nested there before the modern growing practices were instituted," says Butcher. "When the habitat is restored, the bird populations rebound as well.

"If we really want to preserve the birds that frequent agricultural areas, we'll need to set aside natural habitats," says Butcher. "Fields, grasslands, shrublands, parklands—we'll need to create prairie preserves dedicated to these species and other associated wildlife. That's the only hope we have for reversing these declines."

TIM GALLAGHER

Profile: Andrea Priori

Although her office has no windows, Andrea Priori still has a wide view of the world.

On any given morning, she may field calls from a tour guide in England, an ornithologist in Canada, a movie producer in Los Angeles, or a museum director in Illinois—all of them requesting recorded sounds from the Lab's Library of Natural Sounds (LNS). Andy, who runs the LNS User Services Department, pulls the recordings from the collection shelves, selects the best cuts, assembles a tape, and sends it out—by express mail, if necessary. "Everyone has a deadline," she says, and she always meets it.

Before Andy started working at the Lab in 1970, the LNS staff consisted solely of director Ginny Engelhart, and LNS itself was a single, cramped room full of out-of-date equipment. "No soundproofing," Andy remembers. "If someone used the pencil sharpener next door, we went out and asked them to stop."

Her first responsibility was to enter a backlog of recorded sounds into the collection. "We didn't do many commercial productions then," she says, "and User Services got less than a hundred requests a year." She also honed the varied skills her job required: she took the Lab's Home Study Course in bird biology, mastered the studio equipment, and learned how to record birds in the field. "To talk to the recordists, I *had* to know about field recording," she says.

Then she set out to fill some surprising gaps in the collection, recording pigeons, tree sparrows, barnyard animals, even her own dogs. "It's fun when someone requests a sound I've recorded," she says.

Andy also served as the sound engineer for the Lab's radio program, "Know Your Birds," an experience that honed her editing skills. "We cut out sections of tape—a word or a sentence—with a razor blade, and sometimes one would drop on the floor," she remembers. "Then if the show's announcer decided to put the section back in, I'd have to crawl around on my hands and knees looking for it—and risk putting it in upside down."

In the mid-1970s, Jim Gulledge joined LNS as director. He applied successfully for a grant from the National Science Foundation (NSF), and with new funds, the scope of LNS started to expand. As a result of the publicity from the grant, Andy started to field more requests in User Services. "We topped 200 requests in 1980," she remembers.

Soon things got busier still, when Andy began work as assistant producer and engineer for the second edition of Roger Tory Peterson's *Field Guide to Bird Songs of Eastern and Central North America* and the National Geographic Society's *Guide to Bird Songs.* "Producing the field guides was very time consuming," says Andy, "but it was also a good opportunity to look through the collection and take stock." Andy continues to work on tape productions; she was a sound editor for the latest editions of both the eastern and western Peterson field guides. So if you're a birder who enjoys using these tapes, thank Andy.

Meanwhile LNS has continued to grow. In 1990, the staff (now nine!) moved into a brand-new facility: state-of-the art studios, a climate-controlled room for the collection, a tape duplication facility—and a whole new office just for Andy and User Services. The number of researchers, movie producers, and traveling birders calling to request custom tapes keeps growing, too—Andy topped 350 requests in 1992, sending out more than 4,000 different recordings. "It's never dull—maybe that's why I've been here so long," says Andy. "Time has gone by so fast!"

What does the future hold? " I want to learn to use the new digital sound editor that produces compact discs," says Andy—no upside down tape fragments with *this* machine. And she's still recording. "The other night, I recorded my canary," she confides. "Can you believe we didn't have a good canary recording? And we still need a moose for the collection—I think I've got a line on one."

—*Cynthia Berger*

Bird Conservation the Focus at California Seminar

A Lab-sponsored event in San Francisco this past fall attracted a crowd of Californians. On Saturday afternoon, October 17, almost 150 friends of the Lab gathered at the Mark Hopkins Inter-Continental Hotel for a talk by Lab staff on "Partners in Flight," the ambitious new bird conservation initiative. That evening, biologist and author Paul Ehrlich spoke about the status of endangered birds worldwide.

The event was an opportunity for Lab members who live far from Sapsucker Woods to hear first-hand about the Lab's involvement in Partners in Flight. This cooperative venture to monitor and protect the migratory birds that breed in North America and winter in the neotropics involves federal and state agencies, nongovernmental organizations such as the Lab, and similar organizations in Central and South America.

Speaking about Partners in Flight were Lab staff members Rick Bonney, Greg Budney, and Greg Butcher. Their multimedia presentation included bird sound recordings from LNS.

Paul Ehrlich's presentation, "Birds in Jeopardy," drew on his recent book of the same title. The talk was followed by a dessert reception, where guests enjoyed a display of bird art by Darryl Wheye, the illustrator for *Birds in Jeopardy.*

Both events met with enthusiasm from those who attended. Similar events for Lab members and friends are planned in other locations later this year. Stay tuned for more details.

Courtesy of Stanford University

Paul Ehrlich

AROUND THE LAB

Greg Butcher

Greg Butcher, director of Bird Population Studies, will be leaving the Lab in June. Our loss is someone else's gain—Greg is the new executive director of the American Birding Association.

Greg joined the Lab in 1984, fresh out of graduate school and anxious to make his mark in the world of ornithology. Under his guidance, the Lab's Bird Population Studies program has become a valuable resource for studying North American birds and has provided answers to crucial questions about the status of our changing bird populations. Greg's energy, quick humor, and helpful guidance have been appreciated by his colleagues, Lab members, and friends.

All of us at the Lab wish Greg good luck in his new adventure.

Project FeederWatch coordinator **Erica Dunn** has taken a position with the Canadian Wildlife Service, where she will be a research scientist in charge of bird surveys. Ricky joined the Lab after running the Ontario Bird Feeder Survey at Long Point Observatory for 10 years—she became curious about what was happening at feeders in the rest of North America and approached us with the idea for Project FeederWatch.

Six years later, the project's data banks are bulging. FeederWatch has identified the most common feeder birds in each state and province, documented periodic invasions by pine siskins, red-breasted nuthatches, and other species, and documented sources of bird mortality at feeders.

We couldn't have done any of this without Ricky, an accomplished scientist and vice president of the American Ornithologists' Union who has a flair for communicating with bird watchers. One of her many contributions as FeederWatch coordinator was to write most of the articles in the project newsletter, *FeederWatch News.*

Ricky will not completely sever her ties to the Lab: she is working on a book about feeder birds that uses data collected by Project FeederWatch. We wish her the very best in her new position. The future of bird populations in Canada looks bright with Ricky studying the situation.

Project FeederWatch will continue; participants are currently wrapping up the 1992-93 data collection season. The Lab's education outreach coordinator, Margaret Barker, will assume the responsibilities of FeederWatch coordinator.

DAVID HUSSELL

Erica Dunn

The Bioacoustics Research Program welcomes two new staff members. **Dave Mellinger**, a post-doctoral researcher, is developing special computer software for modeling sound perception. He received his Ph.D. in computer science from Stanford University. **Sean Cunningham**, an applications programmer, recently graduated from Cornell with a B.A. in computer science. He is adding new features to Canary, BRP's novel sound analysis software package.

BirdWatch, the Lab's weekday radio program, features fun facts, tips, the latest research, and great bird sounds from our Library of Natural Sounds. Check the listings below for the station nearest you!

Cornell Lab of Ornithology BirdWatch Affiliates

State	City	Call letters	Frequency	Air time
ALABAMA	Florence	WBCF	1240 AM	10:50 A.M.
	Muscle Shoals	WQPR	88.7 FM	5:30 A.M.
	Tuscaloosa	WUAL	91.5 FM	5:30 A.M.
ARIZONA	Flagstaff	KNAU	88.7 FM	6:30 A.M.
	Tucson	KGVY	1080 AM	6:15 A.M.
ARKANSAS	Harrison	KHOZ	900 AM	6:20 A.M.
	Jonesboro	KASU	91.9 FM	6:20 A.M.
CALIFORNIA	Bakersfield	KPRX	89.1 FM	7:58 A.M.
	Eureka	KHSU	90.5 FM	4:20 P.M.
	Fresno	KVPR	89.3 FM	7:58 A.M.
	Modesto	KADV	90.5 FM	6:55 P.M.
	Monterey	KAZU	90.3 FM	8:15 A.M.
	Redding	KNCA	89.7 FM	2:30 P.M.
	Sacramento	KJAY	1430 AM	3:30 P.M.
COLORADO	Aspen	KAJX	91.5 FM	varies
	Ignacio	KSUT	91.3 FM	9:00 A.M.
CONNECTICUT	Storrs	WHUS	91.7 FM	12:00 Noon
DELAWARE	Milford	WYUS	930 AM	7:45 A.M.
FLORIDA	Fort Myers	WSFP	90.1 FM	8:29 A.M.
	Melbourne	WMMB	1240 AM	5:25 A.M.
	Orlando	WMFE	90.7 FM	5:00 A.M.
	Tampa	WGUL	860 AM	5:45 A.M.
ILLINOIS	Carbondale	WSIU	91.9 FM	6:30 A.M.
	Chicago	WNIB	97.1 FM	6:15 A.M.
	Watseka	WGFA	1360 AM	10:35 A.M.
INDIANA	Chesterton	WDSO	88.3 FM	12:00 Noon
	Evansville	WKPB	89.5 FM	8:30 A.M.
	Fort Wayne	WBNI	89.1 FM	10:05 A.M.
	Gary	WAKE	1500 AM	7:26 A.M.
	Muncie	WBST	92.1 FM	11:04 A.M.
IOWA	Cedar Rapids	KMRY	1450 AM	8:40 A.M.
KENTUCKY	Bowling Green	WLBJ	1410 AM	8:10 A.M.
	Elizabethtown	WKUE	90.9 FM	9:30 A.M.
	Lexington	WLXG	1300 AM	7:35 A.M.
	Somerset	WDCL	89.7 FM	9:30 A.M.
LOUISIANA	Hammond	KSLU	90.9 FM	6:30 A.M.
	Lafayette	KRVS	88.7 FM	9:58 P.M.
	New Orleans	WWOZ	90.7 FM	6:01 A.M.
MAINE	Bangor	WMEH	90.9 FM	9:00 A.M.
	Calais	WMED	89.7 FM	9:00 A.M.
	Portland	WMEA	90.1 FM	9:00 A.M.
	Presque Isle	WMEM	106.1 FM	9:00 A.M.
	Waterville	WMEW	91.3 FM	9:00 A.M.
MARYLAND	Wilmington	WSER	1550 AM	6:17 A.M.
MASSACHUSETTS	Boston	WGBH	89.7 FM	9:00 A.M.
	Marlboro	WSRO	1470 AM	6:58 A.M.
	North Adams	WMNB	100.1 FM	11:00 A.M.
MICHIGAN	Alpena	WCML	91.7 FM	1:06 P.M.
	Detroit	WDTR	90.9 FM	12-1:00 P.M.
	Flint	WFDF	910 AM	8:50 A.M.
	Grand Rapids	WGVU	1480 AM	12:25 P.M.
	Lansing	WKAR	90.5 FM	8:06 A.M.
	Mt. Pleasant	WCMU	89.5 FM	1:06 P.M.
	Muskegon	WQWQ	1520 AM	9:03 A.M.
	Sault Ste. Marie	WCMZ	98.3 FM	1:06 P.M.
	South Bend	WAUS	90.7 FM	9:15 A.M.
MINNESOTA	Duluth	WSCN	100.9 FM	4:30 A.M.
	Fargo-Moorhead	KCCD	90.3 FM	4:30 A.M.
	LaCrescent	KXLC	91.1 FM	4:30 A.M.
	Minneaplis	KNOW	1330 AM	4:30 A.M.
	Rochester	KZSE	90.7 FM	4:30 A.M.
	St. Cloud	KNSR	89.9 FM	4:30 A.M.
	St. Peter	KGNA	91.5 FM	4:30 A.M.
	Thief River Falls	KNTN	102.7 FM	4:30 A.M.
MISSOURI	Springfield	KTOZ	1060 AM	8:30 A.M.
	St. Louis	WSIE	88.7 FM	5:15 A.M.
MONTANA	Bozeman	KBMN	1230 AM	2:17 A.M.
NEBRASKA	Omaha	KIWR	89.7 FM	11:00 A.M.
NEW HAMPSHIRE	Portsmouth	WWEM	96.7 FM	6:50 A.M.
NEW MEXICO	Albequerque	KHFM	96.3 FM	5:55 A.M.
	Pine Hill	KTDB	89.5 FM	varies
NEW YORK	Albany	WAMC	90.3 FM	9:00 A.M.
	Buffalo	WEBR	970 AM	11:43 A.M.
	Canajoharie	WCAN	93.3 FM	9:00 A.M.
	Canandaigua	WLKA	102.3 FM	6:45 A.M.
		WCGR	1550 AM	8:25 A.M
	Elmira	WENY	1230 AM	4:50 P.M. and 5:50 P.M.
	Hornell	WLEA	1480 AM	9:40 A.M.
	Ithaca	WHCU	870 AM	12:28 P.M.
	Jeffersonville	WJFF	90.5 FM	7:33 A.M.
	Kingston	WAMK	90.9 FM	9:00 A.M.
	Nassau County	WLIM	1580 AM	6:51 P.M.
	Newark	WACK	1420 AM	5:45 A.M.
	Newburgh	WTBQ	1110 AM	7:15 A.M.
	Oswego	WRVO	89.9 FM	12:18 P.M.
	Penn Yan	WYLF	850 AM	4:10 P.M.
	Rochester	WXXI	1370 AM	6:15 A.M.
			91.5 FM	6:15 A.M.
	Seneca Falls	WSFW	1110 AM	6:40 A.M.
	Ticonderoga	WANC	103.9 FM	9:00 A.M.
NORTH CAROLINA	Charlotte	WNSC	88.9 FM	8:35 A.M.
	Greenville	WNOS	1450 AM	8:50 A.M.
	Madison	WMYN	1420 AM	9:50 A.M.
	Rockingham	WAYN	900 AM	9:00 A.M. and 2 P.M.
NORTH DAKOTA	New Town	KMHA	91.3 FM	9:00 A.M.
OHIO	Cleveland	WCLV	95.5 FM	7:20 A.M.
	Youngstown	WYSU	88.5 FM	11:58 A.M.
OKLAHOMA	Oklahoma City	KTOK	1000 AM	5:30 A.M.
	Tulsa	KCMA	92.1 FM	7:30 A.M.
OREGON	Ashland	KSMF	89.1 FM	2:30 P.M
	Coos Bay	KSBA	88.5 FM	2:30 P.M.
	Grants Pass	KAJO	1270 AM	12:43 P.M.
		KAGI	930 AM	2:30 P.M.
	Klamath Falls	KSKF	90.9 FM	2:30 P.M.
PENNSYLVANIA	Bedford	WAYC	1600 AM	8:43 A.M.
	Clarion	WWCH	1300 AM	7:40 A.M.
	Kane	WLMI	103.9 FM	11:03 A.M.
	Lansford	WLSH	1410 AM	9:35 A.M.
	Philadelphia	WHYY	90.9 FM	6:59 A.M.
	Pittsburgh	WDUQ	90.5 FM	7:58 A.M.
	Reading	WEEU	850 AM	9:45 A.M.
RHODE ISLAND	Providence	WLKW	790 AM	5:30 P.M.
SOUTH CAROLINA	Aiken	WLJK	89.1 FM	8:30 A.M.
	Beaufort	WJWJ	89.9 FM	8:30 A.M.
	Charleston	WSCI	89.3 FM	8:30 A.M.
	Columbia	WLTR	91.3 FM	8:30 A.M.
	Conway	WHMC	90.1 FM	8:30 A.M.
	Greenville	WEPR	90.1 FM	8:30 A.M
	Sumter	WRJA	88.1 FM	8:30 A.M.
SOUTH DAKOTA	Sturgis	KBHB	810 AM	3:15 P.M.
TENNESSEE	Chattanooga	WSMC	90.5 FM	4:08 P.M.
	Johnson City	WETS	89.5 FM	3:00 P.M.
	Knoxville	WUOT	91.9 FM	5:58 A.M.
	Memphis	WREC	600 AM	8:45 A.M.
	Nashville	WPLN	90.3 FM	8:15 A.M.
TEXAS	El Paso	KTEP	88.5 FM	11:58 A.M.
	Galveston	KGBC	1540 AM	1:45 P.M.
	Houston	KPFT	90.1 FM	6:40 A.M.
	Killeen-Temple	KNCT	91.3 FM	10:20 A.M.
UTAH	Salt Lake City	KBYU	89.1 AM	12:15 P.M.
	Spanish Fork	KHQN	1480 AM	12:15 P.M.
VIRGINIA	Yorktown	WYCS	91.5 FM	9:00 A.M.
WISCONSIN	LaCrosse	WZFR	94.5 FM	7:00 A.M.
	Oshkosh	WHBY	1230 AM	5:45 A.M.

STATE FARM INSURANCE BirdWatch is made possible by State Farm Insurance.

Birdscope, ISSN 1041-6676, is published in December, March, and June by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone (607) 254-BIRD. *Birdscope* is free to members of the Lab, a nonprofit, membership organization for the study, appreciation, and conservation of birds. For information on membership please write to our Membership Department.
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of ongoing biological studies, most of which are funded by progressive local jurisdictions, public utilities, and private development companies. Some primary research questions remain to be answered: How large must coastal sage scrub tracts be in order to ensure long-term viability of target species such as gnatcatchers? What vegetation types can serve as effective connecting corridors between patches of coastal sage scrub? What are the effects of patch size on reproductive success? Armed with the preliminary answers to such questions, biologists, conservationists, land-use planners, developers, and regulatory agencies are negotiating creative solutions to protect large blocks of habitat that would otherwise be lost.

Will conservationists ultimately win or lose the battle to save the California gnatcatcher? If our definition of victory is based on whether the name *Polioptila californica californica* ever appears on the U.S. endangered species list, then I think the race is still too close to call. But if our objective is to show that land-use planning based on the principles of conservation biology can preserve viable tracts of coastal sage scrub, then efforts to protect this small gray songbird have already brought significant steps in the right direction. ■

Jonathan L. Atwood is a senior staff scientist at Manomet Bird Observatory in Massachusetts.

Treasure of the Sierra Nevada

by Cynthia Berger

An inside peek at the Lab's annual sound recording workshop

Backlit by the slanting sunlight, fuzzy lichens glow neon green on the trunks of the ponderosa pines. The hillside is slippery with brown needles. For the past hour I've been trying to record the calls of a mountain chickadee—usually a tame, approachable species, but this one won't let me get close. As I lug my heavy tape recorder up the slope, I mentally chant the golden rule of recording: "Halve the distance to double the sound level."

This field recording workshop, run by the Lab's Library of Natural Sounds (LNS), has taught me a lot: how to use my recorder, how to solder cable, and how to focus a parabola. The scenery at 6,000 feet in California's Sierra Nevada is breathtaking; the food at the San Francisco State University Field Station, where we're staying, is delectable; the LNS instructors are friendly and competent. And I've seen five life birds this morning. But if I don't learn how to sneak closer to them, I'm not going to do much recording.

When I decided to take this workshop, I was cocky. How hard could it be to record a singing bird? Point a microphone in the right direction and push the "record" button—easy. But I've learned it's not so simple. Good recordists master three disparate sets of skills. They know how to get the most out of their equipment, the way a professional photographer knows how to use lenses, filters, and film. They know their birds: not just identification but what each bird is doing and why—how sound relates to behavior. The third skill is less tangible: a talent for capturing accurate but also beautiful sounds.

Still, I try to blame my failure with the chickadee on the heavy recorder, a 22-pound Nagra IV-S. Greg Budney, curator of LNS and the chief course instructor, is unsympathetic. "Dolly Minis carries a Nagra, and she's 80," he tells me briskly. "Haven't you recorded those chickadees yet?"

Natural sound recording has come a long way since the 1930s, when Arthur A. Allen, Cornell's first professor of ornithology, needed an entire truck to carry his equipment. Allen and his students, Albert Brand and Peter Paul Kellogg, started recording on 35mm movie film because audio-only tape hadn't been invented yet. Their recorder mangled high-frequency sounds. And getting close to singing birds was even harder in a truck than it is on foot. Back then, my Nagra would have been a featherweight wonder.

Today recordists can choose from a variety of equipment: reel-to-reel Nagra and Uher recorders; cassette recorders from Sony and Marantz, and the newest technology, digital recorders that record using a process similar to videotape technology. The new gear is lightweight, and the sound quality is remarkably good.

Birders have benefited. Albert Brand's interest in recording was driven by his vision of how much more convenient bird study would be if he could listen to bird sounds *before* he went in the field. Birders today take for granted the excellent and inexpensive "field guide" tapes available, but 60 years ago they were just a gleam in Brand's eye.

SANDRA GAUNT

CYNTHIA BERGER

Workshop participants visit a variety of habitats; each offers unique recording challenges. Above, the view north from Yuba Pass—birds are hard to spot in these tall conifers, which also muffle sounds. At right, Linda Ferry shows how to handle a heavy recorder: use the "sit-and-wait" technique.

BHL

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Most recording spots are pristine and breathtakingly scenic, but good recordists take advantage of every opportunity. Above, a gravel pit, where Frank Dorritie and Penny Delevoryas focus on a fledgling black-headed grosbeak. At right, are these men lassoing uncooperative birds? No, LNS instructors Greg Budney, right, and Dave Herr are about to place a microphone cable near a pygmy nuthatch nest cavity. Far right, Bioacoustics grad student John Bower weighs the merits of a jumbo parabola.

Beyond bird watching, ornithologists have been quick to use sound recording in research and conservation: to study avian taxonomy, communication, and behavior; to document vanishing species; to conduct censuses and surveys; and in a host of other applications.

Take one of the course participants, Kim Nelson, a wildlife biologist at Oregon State University. Her work involves marbled murrelets, endangered seabirds that nest high in the canopy of coastal old-growth forests. She's here to learn what combination of equipment will make the best recordings in the sound-squelching forest habitat. Then there's Paul Nolan, a graduate student at the University of California, Davis, who has been studying vocalizations of the yellow-naped Amazon, a parrot species, in Guatemala. And Penny Delevoryas, an environmental consultant, surveys birds as part of the environmental impact review process.

Not everyone here is a researcher, though. On the first day of the workshop, when we gather for introductions in the field station dining hall (which doubles as a classroom), I'm struck by how varied our group is. Miner Long, a retired geologist, records for pure pleasure. Frank Dorritie is a record producer who wants to use bird sounds in his productions. Dave and Linda Ferry are physicians and experienced bird banders who want to try a new aspect of birding.

Introductions completed, we spread out our equipment. Course instructor Dave Herr (a Lab associate and U. S. Forest Service biologist from Washington) shows me how to attach the end of a fresh tape to the empty take-up reel. I sling the Nagra on bandolier-style and cinch the waist strap. The microphone, mounted in a clear acrylic parabolic dish the size of an institutional salad bowl, is already plugged into the recorder. Dave pops a pair of earphones on my head and hands me the parabola.

Outside I hear the rapid trill of a chipping sparrow. Bob Grotke, the LNS sound engineer, has hidden a tape recorder 10 feet up in a big spruce. "The parabola is an amplifier—it focuses the sound waves on the microphone," Dave tells me. "You have to aim it directly at the bird; it has a 'sweet spot,' like a tennis racket." I wave the parabola in slow cruciform patterns—up and down, left to right—until it's aimed perfectly and the sound is clear. Then I check the volume level and creep forward until the Nagra's meter indicates that the sound intensity has doubled. It's a graphic demonstration of the "halve-the-distance" rule—and it's easy to do when your "bird" is tied to the tree.

Dave explains that my parabola snags sound waves the way a catcher's glove intercepts a ball. The microphone converts the sound from mechanical energy to electrical energy. Then my Nagra's "record" head converts that electrical energy to patterns on the field of magnetic par-

CYNTHIA BERGER (3)

ticles that coat the surface of the audio tape. The chipping sparrow tape player is reversing this process.

Instructor Randy Little, an electrical engineer from AT&T, lets everyone try out his 36-inch, camouflage-painted parabola. It's so big, I can't see where I'm walking. The larger the surface area, he tells us, the greater the amplification. Furthermore, big parabolas work better than small ones for capturing long-wavelength, low-frequency sounds—hooting owls, for example.

Next we try the zeppelin-shaped shotgun microphones. They're easier to focus than the parabolas—good for following moving birds—and easier to handle in dense brush. But I have to get much closer to the "sparrow" than I did with the parabola before the Nagra's meter shows the sound level is high enough to record. Electrical preamplifiers boost the sound, but add background noise to the recording. Still, most recordists prefer the shotgun for survey work, where they're trying to get a fast "snapshot" of all the species in a particular location.

The next day we descend from the field station to Dyson Lane, a dirt road that cuts between expanses of rangeland. The morning is cool, and thin shreds of fog are tangled in the dry, yellow vegetation. I hear willets overhead and, from the reeds, the strangled songs of yellow-headed blackbirds. A Brewer's blackbird cranks out his song from a fence post. I listen through the headphones. They're magical—the wheezy sound is purified, surreally beautiful. They're also practical, allowing me to monitor the quality of the recording. The Nagra has separate "record" and "playback" heads, so that a fraction of a second after the sound is recorded, I hear it played back through my headphones.

I record, transfixed, until the weight of the Nagra tires me. When I switch it off, Steve Pantle, the LNS instructor who has been coaching me this morning, clucks his tongue. "Keep the tape rolling as long as the bird is singing," he tells me. "You never know what will be useful, even with a common species like this one. I recorded 15 minutes of American robin the other morning—the most ordinary species in the world—and it turned out to be better than anything in the LNS collection so far."

Later, back at the field station, I clean the Nagra; a tiny grain of dust can ruin the record head. As I dust the heads with a camel's hair brush and swab them with alcohol, Sandy Gaunt reviews the tapes she made that morning. Sandy is an advanced student—the director of the Borror Lab of Bioacoustics. Her digital recorder, a Rotating Head Digital Audiotape (RDAT), weighs about three pounds and uses miniscule cassettes that hold up to two hours of recordings each—quite a contrast to the Nagra's 8-minute reels. "The RDAT's a power hog though," Sandy says. "The battery pack only lasts about two hours, compared to more than twenty-five for a Nagra. I'm having a solar panel built so I can recharge the batteries in the field."

Greg circulates through the room, generous with praise as he listens to each student's recordings. "That's good! You got it right in range!" he tells Laura Cohen. She's using a Marantz cassette recorder, lightweight and much less expensive than the Nagra. Bob Grotke compares the capabilities of the two recorders. "You want to record with minimum distortion and as little background noise as possible," he tells us. "An open-reel recorder, because of its higher tape speed and much wider tape surface, puts a louder, more distortion-free signal onto tape than this cassette machine can. It's like the difference between high-resolution and low-resolution TV screens—more points per square inch. But technique is just as important as equipment—a recordist with good technique and a cassette recorder may get better recordings than someone with superior equipment who doesn't use it correctly."

After dinner, John Bower, a graduate student in the Lab's Bioacoustics Research Program (BRP), loads a disk into the Macintosh computer he has brought along. The software package, called "Canary," was developed by BRP; it's an inexpensive, user-friendly way to analyze bird sounds on-screen. John cables his Nagra to the computer and inputs a hermit thrush song. Then he calls it up on screen in the form of a sonogram and, with a few keystrokes, removes the song of a bird singing in the background, expands one section of the thrush song to see the details of individual notes, and has the computer play the sound back to us. Enthralled, we stay up late taking turns at the keyboard.

We regret it the next morning, because we rise an hour earlier than usual for the long drive to Jones Valley. The broad meadow and surrounding forests promise mountain bluebirds and western meadowlarks, Clark's nutcrackers and red crossbills. But the wind picks up, blowing across the microphones and making recording almost impossible.

Later, when the wind dies down a little, I try out a shotgun microphone that's been fitted with a

Resources for Bird Sound Recording

CYNTHIA BERGER

Equipment

So you want to get started recording bird sounds. What equipment should you buy? You *can* record bird sounds with almost any type of recording system; however, if you want to record with reasonable fidelity, consider the following points.

First, good recording technique is every bit as important as the equipment itself. Some recordists spend thousands of dollars on the best equipment, others spend much less. Regardless of equipment, the recordist with the best technique makes the best recordings.

Expect to spend about $1,000 for a good-fidelity system. A variety of audio recorders and accessories is available. A complete system includes a microphone, tape recorder, headphones, and associated cables. Remember that your entire system can perform only as well as the weakest component. Don't purchase an expensive high-fidelity recorder and use it with a low-performance microphone—unless you're planning to upgrade the microphone.

Two styles of microphone systems are most often used for recording bird sounds: the parabolic reflector-plus-microphone system and the shotgun microphone. Which system you select depends on the types of birds you will be recording and the degree of convenience you require.

Here's the basic system recommended by the Lab's Library of Natural Sounds for beginning recordists:

- Marantz PMD-222 "bird version" cassette recorder with carrying case
- 13" Sony parabolic reflector with Sennheiser ME20 electret condenser microphone, or Sennheiser ME80/K3U/MZW415 shotgun microphone system
- AKG-K141/2 headphones
- Interconnecting cable

Publications

Published information about tape recording bird song is far from complete and may be hard to find. Some books are readily available; others may be found at university libraries or special ordered through a catalog or bookstore.

- Bartlett, Bruce. *Practical Recording Techniques.* Carmel, Indiana: Prentis Hall Computer Publications, 1992.

A good reference for the beginner or moderately experienced recordist. Describes the recording process, types of microphones, microphone technique, and so on.

- Borwick, John. *Sound Recording Practice.* New York: Oxford University Press, 1987.

A solid technical reference book covering all aspects of sound recording, with a particularly strong chapter on microphones.

- Jellis, Rosemary. *Bird Sounds and Their Meaning.* Ithaca, New York: Cornell University Press, 1984.

An informative, easy-to-read book. Covers how birds produce sounds, song learning and song mimicry, and dialects; brief section on research techniques.

Getting Started

The best way to learn about recording is by going out into the field with an experienced recordist. How do you find one? You'll meet several if you take the LNS Sound Recording Workshop. If you can't get away for a week in California, try asking your local birding club if anyone in your area records birds.

If you do take up sound recording, you'll find it brings you some fringe benefits. Your listening skills will improve, making you a better "ear-birder." You'll become aware of common sounds you'd overlooked before. Recording lets you share what you have heard with others or relive an eventful field trip through sound. Finally, volunteer recordists are making valuable contributions to the study of animal communication. And you need not travel far and wide—even the birds in your own backyard may be a source of as yet unrecorded sounds.

—Greg Budney

fuzzy windscreen. I also learn some alternatives to stalking mountain chickadees. One is the sit-and-wait approach. Linda Ferry has already used this technique to good advantage at a nest: she found a comfortable mossy log where she could sit and rest the heavy Nagra, and when the adult birds went back to work ferrying small caterpillars to their young, she got some great recordings. Another alternative is to set up a remote mike: place a microphone near a song perch or nest, then run a long cable to the recorder some distance away. Steve and Bob used this technique to record two white-headed woodpeckers feeding their nestlings.

In our afternoon class, Greg compares species recording and survey recording. The goal of species recording is to document the entire repertoire of a single species—anything from a male's territorial and mate-advertising songs to alarm, distress, and hunger calls. Another goal of species recording is to accumulate many examples of each sound, so researchers can study the variation within the songs made by one individual, among individuals in a population, or between populations.

The goal of survey recording, in contrast, is to get a representative sample of all the species in a geographic area—an ecosystem-level measurement. "With species recording," Greg says, "it's best to record only if you can identify the singer. With survey recording, identification is secondary to documentation, so record first and ask questions later."

Greg has set the class a challenge: Who will be the first to record five species of flycatchers? One of them, the gray flycatcher, sings a predawn song, different from the familiar *chi-bit* dawn song, that has hardly ever been recorded, and Greg wants it for the collection. At four o'clock one morning we bump down a dirt road toward the Harnach Ranch, a known gray flycatcher hangout.

Dave Herr points me toward a stumpy pine. A flycatcher sings as I creep forward, trying to halve the distance. When I pull in a perfect signal, I switch to "record" mode. It's hard to stand like a statue, but I keep the tape rolling. Then, in the growing light, I notice that the tree is completely surrounded by recordists, like tourists at a monument taking pictures of each other taking pictures. When the bird finally falls silent we burst out laughing.

Our last night at the field station, we assemble in the director's cabin, cozy with pine paneling and a stone fireplace. John Bower has rounded up a guitar, and Frank Dorritie has a flute. Together they play country-western standards while we stomp on the floor and sing along in our best twangy voices.

Later we compare notes. Dave Ferry won the flycatcher challenge; I finally recorded a chickadee. Greg says Laura Cohen's recording of red crossbills in flight is better than any of the red crossbill recordings in the LNS collection so far. Paul plays us some parrot sounds, and Kim talks about her research plans for the summer.

I think about how my understanding of recording has changed. It's more than pushing a button. Yet after this week I feel ready to record on my own. Was this workshop what you expected?, I ask Linda Ferry. "Much better," she answers. I have to agree. ■

This year's LNS Field Recording Workshop will take place June 6-13, 1993. Tuition is $575; college credit is available from San Francisco State University for an additional $120. The fees cover the cost of instruction, ground transportation from Reno, Nevada, and all food and lodging. Participants are asked to bring their own recording equipment; a limited amount of equipment is available on loan from LNS.

For more information about the sound recording workshop or other LNS activities, please contact Greg Budney, Curator, Library of Natural Sounds, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. (607) 254-2404

TAHOE
National
Forest
CAMPGROUND
Berger Creek

TED CHEESEMAN

Smiling faces, above, answer the question, "Did you get what you came for?" The LNS sound recording workshop offers something for everyone—researchers, graduate students, environmental professionals, hobbyists, and rank amateurs. Even the author, below, finally recorded a mountain chickadee, far left.

Putting Our Sounds to Work: New Releases from LNS

The LNS collection of natural sound recordings—the largest in the world—has been built from the voluntary contributions of recordists around the world. The collection is a working library and a significant scientific resource. Here are reviews of the latest commercial productions released by LNS.

A Field Guide to Western Bird Songs *(Second Edition)*

Cornell Laboratory of Ornithology,
Interactive Audio. Houghton Mifflin
Company, Boston. 1992.
Cassettes $35.00; CDs $40.00

Since "bird watching" is really, in large measure, "bird listening," field guides to birds must satisfy both of these important senses. Roger Tory Peterson recognized this long ago, and the first editions of his eastern and western field guides to bird songs (available originally as 33 RPM records and later as cassettes) were major advances for birders across the continent. Now, improved second editions for each guide are available on cassettes and compact discs.

The new western guide consists of three cassettes (or two CDs) and a booklet that provides technical details and credits along with a list of the 522 species covered. In this edition, Alaskan birds have been added, while Hawaiian birds have been dropped, which makes more sense.

It is widely accepted in the birding and scientific communities that written and illustrated field guides are no more than "guides"—it is beyond their scope to encompass all known detail and variation within a species. Audio guides are no different. Most birds have complex vocal repertoires, and intrapopulation and regional variation in songs (and often call notes) is the norm, at least for passerines. Peterson's guide can only offer a selection of the bird sounds that emanate from the West, but even this "selection" is a prodigious and enormously useful compendium.

Quibbles with any such guide are inevitable. The recordings don't always live up to the billing of presenting "the most typical and frequently heard vocalizations of each species." For example, the most typical call notes of many species—including hooded oriole, bobolink, red-throated pipit, and many *Empidonax* flycatchers—are missing. Since call notes may be hard to record and don't always reproduce well, these omissions are forgivable, if frustrating.

Surprisingly, a few common species are missing. A comparison of calls of elegant and royal terns would have been useful, but the abundant and very vocal elegant tern is not represented!

The sequence of species may prove puzzling to users comfortable with AOU/ABA taxonomy. Species were grouped according to similarity in appearance in the western bird guide, and those groupings were preserved here. This results in wide separations between vocally similar species, e.g., solitary and gray vireos, moorhens and rails, barred and spotted owls, or wood sandpipers (grouped with other Asiatic rarities) and other *Tringa*. This is more of a problem for the cassettes than the CD version.

We still await a bird vocalization compendium that treats all species with the thoroughness of, say, Borror and Gunn's *Songs of the Warblers of North America*. Such a work would be massive and expensive, but the hard work of many recordists (and, notably, Cornell's Library of Natural Sounds) has at least made such a project realistic. The Peterson guides to bird songs will serve us in good stead until an expanded work comes along. There is no substitute for field experience in learning bird vocalizations, but birders at all levels will find themselves frequently referring to the Peterson bird song guides.

— Kimball L. Garrett
L.A. County Museum of Natural History

Voices of the Cloud Forest

Produced by David L. Ross, Jr.,
Library of Natural Sounds, Cornell
Laboratory of Ornithology. $9.95

"As the cloud-laden northeast trade winds traverse the continental divide in Costa Rica's Cordillera de Tilaran, much of their moisture is intercepted, precipitating as rain and blowing mist. This almost constant flow of moisture from the Caribbean, combined with cool mountain temperatures, permits the growth of a luxuriant cloud forest, saturated with water and dripping with life." This introduction to David Ross's aural tribute to the Monteverde Cloud Forest Reserve sets the scene for listeners. You'll enjoy the pleasing tones and rhythms of the birds, frogs, and monkeys as you ponder the evolutionary play in this exquisite ecological theater.

In the predawn, a tink frog and mottled owl compete with the night insect chorus. These sounds fade into the dawn chorus of howler monkey, tawny-throated leaftosser, and barred forest-falcon. The sounds progress through the day and into the evening—41 voices in all. The surprise roar of the Arenal Volcano is unmistakable, but the identity of some other voices may not be immediately apparent. The tape is unnarrated on side one; narrative description is included on side two. Sounds are also listed in order of appearance on the card that accompanies the cassette.

Voices of the Cloud Forest is not just a realistic portrayal of what you might experience during a day in the cloud forest—it is beautiful music, a true composition using natural sounds. The rhythms vary to avoid repetition; water droplets and the tingling tones of a solitaire provide a background for other beautiful natural sounds that combine, fade, and reappear during the presentation. The tape is beautifully produced; the sounds are perhaps the best one can find, and no annoying background sounds interfere with the featured performer of the moment.

Through this production, everyone can appreciate the 10,000-hectare Monteverde Cloud Forest Reserve, and we should be grateful for this access. Many birds that breed in the preserve, including the resplendent quetzal, migrate to lower elevations, where the forests are not protected. The chorus may not be enjoyed by future generations unless we act.

This tape is not meant to be used to identify cloud forest birds. It is music with a message. I hope that the artistry of its composition—combining the human spirit with nature—will herald a new era of similar productions.

—Eugene S. Morton
National Zoological Park

Bird Songs of Belize, Guatemala and Mexico

Produced by Dale Delaney at the
Library of Natural Sounds, Cornell
Laboratory of Ornithology. $9.95

Birds of Eastern Ecuador

By Peter English and Theodore A.
Parker III. Produced by the
Library of Natural Sounds, Cornell
Laboratory of Ornithology. $12.00

These two new cassettes from the Cornell Laboratory of Ornithology are noteworthy both for their technical excellence and for the particular interest and newness of much of the recorded material. Both include the first commercially available recordings of a number of neotropical birds, including some whose voices were unknown as recently as a decade ago.

Together these tapes represent a significant contribution to the growing body of Central and South American bird sound recordings available in cassette format, and to say that they are worth their modest prices would be an understatement. The result of thousands of hours in the field, these cassettes are a generous and helpful contribution to bird watchers interested in the American tropics. All profits from the sale of the Ecuador tape benefit conservation efforts in that country.

A comparison of the two productions may be useful. The Delaney tape is a one-man effort, while the English/Parker tape includes material from as many as 19 recordists. The Delaney tape could have been titled "Bird Songs of Mexico," because all of the 69 species included occur there; indeed, only 13 of the recordings were made in Belize and Guatemala. Similarly, the English/Parker tape, which presents 99 species, could have been called "Birds of Amazonia"; less than a quarter of the recordings were made in Ecuador, and fewer still in eastern Ecuador.

The announcements on the Delaney tape have a breathless, blurted quality, while those on the English/Parker tape are more relaxed and include scientific names, a few of which are mispronounced. In both productions, recordings are arranged in taxonomic order and presented without commentary. The Delaney tape is subtitled "A Selection of Rarities, Regional Endemics, and Distinctive Subspecies," but none of the recordings is specifically identified as belonging to any of these categories.

Each tape is accompanied by some necessarily sparse printed notes: information on recording localities is detailed and informative on the Delaney tape, less so on the English/Parker tape, although a more complete description of locations is available on request. The English/Parker tape does provide habitat information and a Spanish name for each species, however. The notes contain a few errors: the Ecuador notes misspell "curassow," and the substitution of "*Leptoptila*" for the correct "*Leptotila*" is faithfully reproduced in the announcement.

But these flaws are relatively unimportant compared to what has been accomplished: interesting and skillfully recorded bird song. Almost without exception the recordings are remarkably good, loud enough to be effective when broadcast in the field, and in most cases the songs stand perfectly clear of the background and are representative of the species. Many cuts on these two tapes are truly impressive, even after repeated hearings: Dale Delaney's perfectly recorded ocellated turkey, his beautiful solitaire and nightingale-thrush recordings, and his 10 species of flycatchers—not "easy listening" perhaps but altogether admirable. Listening to the English/Parker tape, I was haunted by the long-tailed potoo and positively vibrated by the recordings of nocturnal and Salvin's curassows. We should feel lucky—and grateful—that such fine recordings as these are now available for our interest and enjoyment.

—Davis W. Finch
Wings

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MARK WILSON

Audubon's painting, at right, captures two tree swallows engaged in an intense aerial battle, all for the sake of a feather. A bird that successfully runs the gauntlet of other attacking swallows can add the feather it carries to its nest lining, above.

A Fondness for Feathers

by David W. Winkler

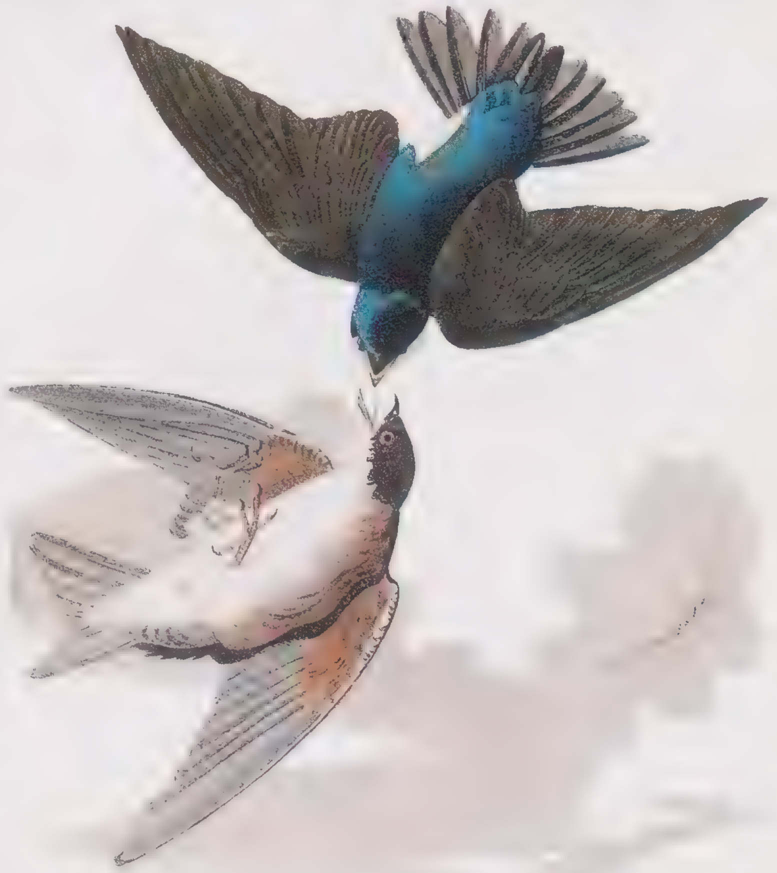
For tree swallows, a well-feathered nest can spell survival

When John James Audubon painted the "Green-Blue or White-bellied Swallow" for his famous book, The Birds of America, *he depicted two birds in a violent midair confrontation, with their bodies twisted and bills agape. To the right of the dueling birds is a single large white feather, floating in the air. This vignette captures the essence of the early spring behavior of the bird he portrayed, a bird we now call the tree swallow.*

Every spring, all across the northern two-thirds of our continent, tree swallows engage in noisy, energetic aerial chases and bill-to-bill combats over large feathers. These "feather fights" can last more than a minute and involve a dozen or more birds. The typical feather fight develops something like this: In the midst of foraging, a swallow spots a feather, snatches it up, and then attempts to fly straight to its nest box. If the bird is lucky enough to make it there still carrying its prize, it will incorporate the feather into its nest lining. But if other tree swallows are foraging in the vicinity, the bird may well have to run a gauntlet of attacking swallows on the way back to its nest. Often, one or more birds confront the feather owner, fluttering in front of it and jabbing at the feather with their bills.

As often as not, the feather soon "changes bills," and the new feather-owner flies off toward its nest carrying its booty. Unfortunately, the thief is no more likely than the feather's original owner to reach its nest unimpeded, and the chase is on again. These challenges and feather exchanges can occur rapidly, with the feather sometimes changing bills three or four times within seconds. When large numbers of tree swallows join in the skirmish, they sometimes form a great, fluttering mass of birds, slowly tumbling toward the ground or pond surface, their attention fixed more on the feather than on flight. But the swallows usually come to their senses before crashing down. And eventually one determined bird makes it all the way to its nest with the feather.

I've been studying tree swallows at a facility run by Cornell University since 1985. Five miles north of the Ithaca campus, my study area is a grid of 105 nest boxes set up around a small lake and series of experimental ponds. We usually have approximately 75 pairs of nesting tree swallows. Since the boxes are only about 65 feet apart, there are usually plenty of neighbors around to fight over feathers. Having noticed again and again the



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great fuss these birds stir up over feathers, I decided to investigate the reasons why these feathers are so valuable to the swallows. In 1987 and 1988, my team of assistants and I counted the feathers we found in tree swallow nests at different stages in the birds' breeding cycle and compared the number of feathers we found in each nest with several measures of reproductive success. Interestingly, we found that chicks in nests lined with more feathers fledged earlier.

On the face of it, this result may seem to justify the tree swallows' fondness for feathers, since they appear to decrease the nestlings' period of dependence on parental care in the nest. But there was still a possibility that the earlier fledging of these young had nothing to do with the feathers themselves and was instead due to a third variable—the quality of a given nesting pair. Better parents would probably be more efficient both at getting feathers into their nests *and* at gathering food for their developing chicks. Any bird that could "bring home the feathers" could be signaling to its mate that it is skillful, strong, and committed to the present breeding attempt.

To test further the role of feathers in the nesting of tree swallows, I decided to reduce the number of feathers in selected nests. If the only reason that nests with more feathers have a shorter nestling development period is because they are attended by better parents, then reducing the number of feathers in the nest should produce no change in chick growth rates. If, on the other hand, the number of feathers in the nest lining does directly affect chick developmental rates and nestling periods, then reducing the number of feathers in the nest linings should cause a slowdown in chick growth rates.

To answer this question, we used one of the simplest possible experimental protocols: we would create two groups—a "removal" group in which all the feathers were taken from the nest and a "control" group in which the feathers were left in the nest. We would then test our two hypotheses by comparing the growth rates of chicks between the groups. Before rushing into the field, however, we had to ensure that our two groups would be as nearly identical as possible to each other in all aspects of their breeding biologies. In particular, we had to be sure that the qualities of parents in the two experimental groups were comparable, so that any differences observed between groups could be attributed directly to the presence or lack of feathers.

Since the tree swallow is the only North American bird in which females in their first breeding year wear a distinctive brown subadult plumage, we could easily determine which females were novice breeders and ensure that both groups had the same proportion of nests with young females. We also counted and measured the eggs of females as they were laid, and we balanced our experimental groups so that they had the same mean egg and clutch size. And, finally, each group had an equal share of early and late nesting pairs, since the date that birds begin nesting is one of the most accurate indications of the quality of breeding birds and their potential nesting success. When it comes to avian breeding seasons, the early bird not only gets the worm, it also usually gets the best mate and produces the most offspring.

As soon as we had the groups balanced, we were ready to get out in the field and pull some feathers. Compared to the average field experiment, ours was almost shamefully easy to conduct. We merely had to walk up to every nest each day, count all the feathers in each control group nest and remove any feathers we found in the lining of each removal group nest. Since we were attempting to treat the nests in both groups exactly the same, we rustled the nest cups of all the control nests every day with our fingers as we counted the feathers in the nests. (We were careful not to harm the eggs or chicks during both operations.)

We began visiting each nest for feather counting or removal on the day they were assigned to experimental groups, usually the day after the last egg was laid. Daily visits were essential because the parents in the removal group continued adding feathers to their nests throughout the breeding season. We wanted to maintain the maximum possible difference between the control group and the removal group so that we could accurately measure the effect of the feathers. And we had to visit the control nests daily to balance the disturbance to the two groups of nests.

Checking the control nests also provided useful

Page 31: John James Audubon; courtesy Cornell University Library.

TIM GALLAGHER (2)

data on the normal development of nest lining throughout the breeding season. We found that most of the swallows start placing feathers in their nests as soon as the bulk of the grass nest is complete. By the time the first egg is laid, a tree swallow nest usually contains about five feathers. More feathers are added throughout the remainder of egg-laying and incubation, but relatively few feathers are added after the chicks hatch. Indeed, the average number of feathers in the control nests declined after the chicks were about five days old, perhaps because a feather occasionally came out of the nest stuck to a parent or to a fecal sac being removed by a parent. The peak number of feathers in control nests varied dramatically, between zero and 114.

Before we could analyze the results of our experiment, one further balancing of our groups had to be accomplished. Though on average male and female tree swallows take on about equal shares of the work involved in feeding their chicks, individual males vary greatly in the efforts they expend. Indeed, some females must raise their young essentially unassisted by a laggard mate. One of our best indicators of such "lazy" males is the success we have in catching them at their nests. We attempt to capture all of our breeding birds each year to determine their identities and relate their nesting success rates to their past histories. (Yearly capture is necessary because tree swallows have such short legs that they cannot hold enough color bands to allow us to recognize individuals with binoculars.)

Trapping the nesting birds is generally a simple matter when they enter their nest boxes to feed their young. The males we miss are ones that rarely enter their nest boxes; these are almost invariably the same males that shirk their parental duties throughout the breeding season. Because the chicks being reared in a single-parent nest are likely to grow more slowly, we eliminated from both experimental groups any nests in which the male was not captured.

After this final balancing of experimental groups was accomplished, we began analyzing how removing the feathers affected chick growth. We compared weight, wing length, and leg length of the chicks in both groups when they were 12 days old. The results were surprisingly unambiguous: chicks in the feather removal group had significantly shorter wings and legs and weighed less than chicks in the control group. I was surprised that the differences in growth rates were so noticeable. These observations show that feathers in the nest lining have a significant effect on chick development and that the feathers do not merely serve as a signal of parental quality to a bird's mate. In short, tree swallow parents apparently

Author David Winkler, far left, checks the contents of a tree swallow nest box in his study area. Winkler and his assistants visited each nest daily, taking all the feathers away from nests in the removal group and counting feathers in the control group. Above, three swallows vie for a single feather.

JOHANN SCHUMACHER DESIGN

An adult male tree swallow, above, holds tightly to his prize—a feather for his nest lining. Winkler's study showed how valuable feathers are for keeping the nestlings warm and speeding their development. In a cold, harsh spring, young birds that can fledge earlier and take care of themselves sooner have the best chance of surviving.

have good reason to spend so much time and energy fighting over feathers in spring.

After obtaining a clean experimental result, the fun of science is often just beginning. In this case, an interesting question remained: Why do feathers have such a significant effect on chick growth? The most obvious explanation would be that the feathers in the nest lining provide increased insulation for the chicks. The parents insert the feathers into the nest cup with their shafts pointed down; the broad vanes of the feathers thus project up and over the brood in the nest cup. In a well-feathered nest, the young are sheltered by a uniform canopy of feathers, reducing the rate of nest cooling considerably. If the young use less energy maintaining their body heat, perhaps they can devote more of their energy to growth. Of all the continent's swallows, the tree swallow is the most likely to benefit from such a thermal advantage, since the species breeds farther north and earlier than any other member of its family.

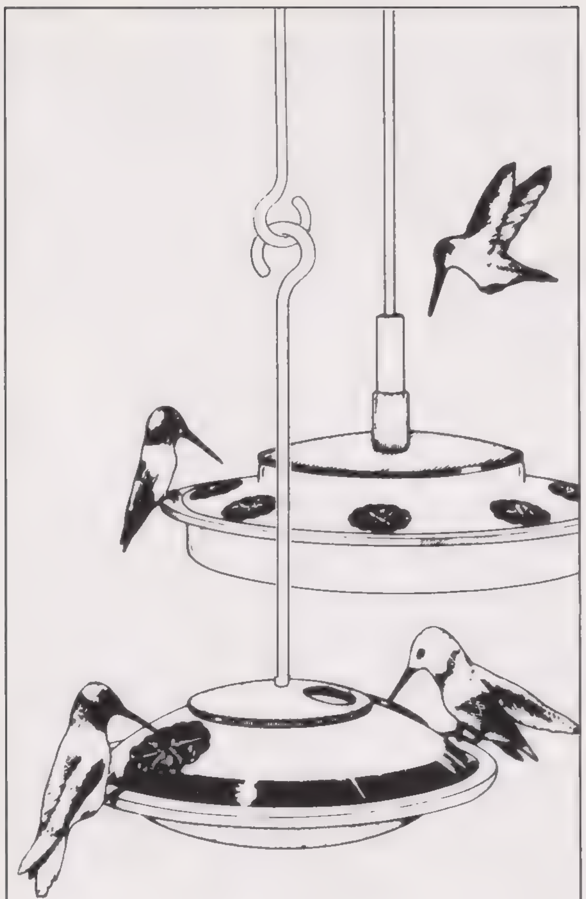
One curious aspect of the feather removal experiment was the lack of significant differences in chick survival rates between the removal and control groups. But the feather removal experiments were done in 1989, a year of excellent conditions for chick growth and survival, so perhaps these results should not be too surprising. The presence of a good feather lining in a nest and the higher chick growth rates that result do not necessarily mean that chicks in a well-feathered nest always have a better survival rate than birds that were raised without such a nest lining. Rather, the feather lining is important because it allows the chicks to fledge earlier if for any reason conditions develop that make life inside the nest box less attractive than life outside.

Accelerated development shortens the time that the young birds are vulnerable to predators such as raccoons that raid nest boxes. But more important, it may help them cope with a major source of tree swallow mortality—the fatal combination of low temperatures and low food supply that occurs when a cold front moves into the area during the nestling period. If cold, wet conditions persist for more than a couple of days, even the best parents may abandon their broods to ensure their own survival.

All birds are affected by cold weather because they must burn up so much energy just to maintain their body temperatures. Tree swallows pay doubly when cold weather hits; just when their metabolic requirements are highest, the flying insects they rely on for food cease flying. Faced by this double bind, most swallow parents must abandon their young and try to find food for themselves. This combination of factors makes a tree swallow breeding season a boom-or-bust affair. Anything the swallow parents can do to speed up their chicks' development will shorten the time that the chicks are most vulnerable to a cold front. Lining their nests with feathers seems to be an important way that tree swallows shorten their chicks' period of parental dependency.

So if you're out this spring and are lucky enough to see tree swallows battling in midair, remember that they're not doing it just for the sake of fighting. They are competing for an important resource that could affect their nesting success. These intense battles can serve as a potent symbol of the rigors that these birds face daily, trying to find food and shelter for themselves and their offspring in an environment that is seldom friendly. And should you happen to see a large feather float by on an early spring breeze, perhaps you'll be inspired to put up a nest box in an open area near your home and welcome these energetic and determined insect hunters into your daily life. ■

David W. Winkler is an assistant professor and curator of birds in Cornell's Section of Ecology and Systematics. He has studied birds ranging from grebes and gulls to starlings and swallows, at study sites in Africa, Europe, California, Utah, and New York.



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Spotlight

THE COMPLEAT CURASSOW

by David S. Wilcove

A great curassow's presence signifies an intact, undisturbed rainforest . . . or does it?

When I told a nonbirder friend that I was going to Belize to see the great curassow, he laughed and tried to correct my pronunciation of the legendary Japanese filmmaker's name. I explained that I was looking for a black-and-white bird about the size of a turkey with a bright yellow knob on its bill. This seemed to satisfy him, but it didn't satisfy me. Sure, I wanted to see a great curassow—I had been looking for one for years—but there was more to my quest than another check mark for the life list. The curassow's presence would be an indication of something quite special: a sign that I had found a more-or-less intact assemblage of lowland rainforest animals. If there were curassows, there would be monkeys, jaguars, tapirs, and harpy eagles. I might not see any of them, but as I hiked through the forest, I would know they were there. And maybe, just maybe, I would be lucky.

The great curassow is one of approximately 13 species of curassows. Members of the Cracid family (which also includes the guans and chachalacas), curassows are denizens of mature tropical forests, where they quietly walk along the forest floor in search of fallen fruit and other vegetable matter. In pristine areas, they can be quite common. Indeed, if one were to weigh all of the individuals of each bird species in an undisturbed tropical forest, the curassows would probably have the greatest "biomass." The same would be true, I suspect, for the wild turkey if one examined (and weighed) all the birds in a virgin hardwood forest in South Carolina at the time of John James Audubon.

But unlike the turkey, which weathered the destruction of the virgin forests of the Southeast and is now making a spectacular comeback, curassows are everywhere in retreat. The International Council for Bird Preservation considers six of the thirteen species to be in danger of extinction; the other seven are disappearing from large portions of their ranges. Curassows are vulnerable for two reasons. Like so many other species, they cannot abide the wholesale destruction of tropical forests. But unlike antbirds and woodcreepers, they are also vulnerable to overhunting. Once a road is sliced through a forest, providing access to hunters, curassows are virtually eliminated. After the construction of new logging roads in Veracruz, Mexico, in 1951, two ornithologists reported that "great piles of feathers of curassows and guans were seen along the newly built roads where previously few hunters had ever been able to penetrate."

The impact of overhunting has been quantified by French ornithologist J. M. Thiollay. Over a six-year period he spent literally thousands of hours censusing tropical gamebirds and raptors in the forests of French Guiana. In places subjected to regular hunting, the density of curassows decreased by 95 percent, from 8.37 to 0.39 birds per 100 hectares. This decline is dramatic but not particularly surprising. What is alarming about Thiollay's data is that hunting pressure as distant as 3 to 20 kilometers (1.8-12 miles) from the study sites reduced curassow populations by a whopping 84 percent. Curassows are known to wander seasonally—no one knows how far—so perhaps these birds were shot when they wandered into hunting areas.

Turkeys in the United States also face intense hunting pressure. Why are they able to withstand it better than curassows? In good habitat and in the absence of hunting, both species occur in about the same densities; thus numerical abundance of turkeys is not the explanation. One obvious reason is that hunting is more strictly regulated in the United States than it is in Central and South America. But even more important, I suspect, are the differing reproductive rates of the two species. A hen turkey will lay a dozen or so eggs per clutch, whereas a curassow typically lays only one or two eggs. In fact, most curassow pairs produce only one young per year. Their populations cannot rebound from hunting as readily as turkeys.

And what of the great curassow, the object of my quest? It is the only curassow that occurs in Central America, ranging from southern Mexico south to Colombia and Ecuador. In previous trips to Mexico, Costa Rica, and Panama, I had hoped to find one, but I never did. Belize had promise. Thinly settled with vast amounts of forest, it also had the advantage of Chan Chich Lodge, an embarrassingly comfortable hotel smack in the middle of a forest reserve where great curassows were alleged to be common.

For seven days I explored the forests around Chan Chich. The days began with the dawn flight of mealy parrots, whose raucous, humanlike voices never ceased to startle me, and ended at dusk with the hoarse whistles of a pauraque, a tropical whip-poor-will that lived on the grassy slopes next to my cabin. In between I experienced a richness of life forms that, had I been knowledgeable enough to recognize even one thousandth of the species, would have numbed my senses.

On several occasions I found large paw prints in the wet mud of the trail, evidence that a jaguar had quietly padded by in the predawn darkness. When a troop of spider monkeys crashed their way through the canopy, I felt as though I was beginning to experience the rainforest the way it was meant to be. But to my growing frustration, I saw no curassows.

Now it's one thing to miss an antbird or a hummer on a bird watching trip. Nobody thinks the worse of you. But how do you explain not finding a 10-pound, ground-dwelling fowl? My ornithological honor was at stake. On my last morning in Chan Chich, I was hiking along a riverbank when I spotted a perfect feather lying in the middle of the trail. It was a big, rufous feather finely barred with black, and it could only have come from a female great curassow. I moved along the trail with jaguarine stealth, but managed only to startle a spot-breasted wren who proceeded to berate me as only a peevish wren can do.

That afternoon I decided to revisit the section of trail that produced the feather. I rounded a corner, heard something thrashing around in the vegetation, and found myself staring at a male great curassow. He was perched about 6 feet above the ground, and judging by the way he raised his crest, not at all comfortable with my presence. With a few flaps of his wings, he dove into thicker vegetation and disappeared.

Jaguar, spider monkey, great curassow. Had I found what I was looking for? Was Chan Chich an example of an intact community, a complete assemblage of the unfathomable diversity of the rainforest? Superficially, it was. The big animals were all present, with the notable exception of the harpy eagle. But the peculiar hills and mounds scattered around the forest were a reminder of Chan Chich's remarkable past: they were Mayan ruins, the remains of temples and other dwellings that were once the hallmarks of a great civilization. What are rich forests today were agricultural lands 1,200 years ago.

As I stared at the buttressed roots of the giant fig trees that now weave their way through the foundations of the temples, pushing apart the stones that countless Maya workers had painstakingly assembled, I wondered whether the diversity that we are so swiftly stripping from the earth can ever return. When our own civilization has exhausted or enlightened itself, will diversity inch forward from the handful of parks and preserves we spare and reclaim the land it once occupied? Perhaps, but surely not all species and definitely not on a time scale meaningful to humans. John Terborgh, the distinguished professor of tropical ecology at Duke University, has observed that the diversity of plants within the forests that were once cleared by the Mayas is anomalously low. Even a millennium is not enough time to restore the diversity of the tropics.

What I had thought to be an intact forest community was, in fact, a damaged one, slowly recovering from injuries inflicted long ago. The best way to protect diversity—perhaps the only way—is to not lose it in the first place. ■

David S. Wilcove is senior ecologist at the Environmental Defense Fund and chairman of the United States section of the International Council for Bird Preservation.

Further Reading

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JOHN CANCALOSI

A part of the whole: The great curassow, denizen of intact and undisturbed rainforest.

The Catbird Seat

PASSING SIGHTS AND SOUNDS

by Pete Dunne

SCENE: A SMALL PARKING LOT SERVING A POPULAR, COASTAL BIRDING AREA BEST KNOWN FOR AUTUMN MIGRANTS. IT IS MIDMORNING. THE LOT IS THINNING. PARKING SPACES THAT WOULD HAVE BEEN FILLED INSTANTLY AN HOUR EARLIER NOW STAND VACANT.

Two birders approach each other from opposite ends of the lot. One is in his late thirties. His walk is brisk; his manner relaxed, open, friendly. His clothes look like they were lifted right out of the pages of Town and Country *magazine and his 10x42 binoculars are so new that the strap squeaks. With the touch of a button on his key ring, a silver Range Rover blinks its lights and chirps a greeting. The other man is younger, in his early twenties. His face is intense but calm, his eyes translucent and alert. He needs a haircut. He is wearing old jeans and a faded World Series of Birding T-shirt. Around his neck hangs a pair of ancient binoculars held together with duct tape. His bicycle is chained to the fence next to the Range Rover. He bends down to unfasten the chain just as the other man arrives.*

EXPERIENCED BIRDER: Hello! How's the birding?

YOUNGER BIRDER: *(looking up, nodding)* Hello. *(he pauses, listening or maybe just thinking before he answers)* The birding's fine.

EXPERIENCED BIRDER: Terrific. Great morning. Got three year birds today: merlin, Cape May warbler, and a gray-cheeked thrush. How about you?

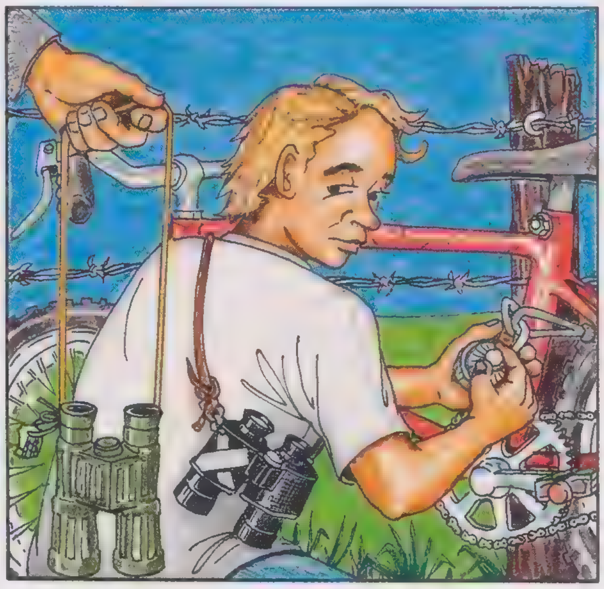
YOUNGER BIRDER: *(he is still bent over, spinning the dial on his combination lock)* A lot of early season neotropical migrants are still coming through, but blackpoll and palms arrived in good numbers. Some middle-distance stuff turned up as well. Phoebe, white-throat, kinglets. *(he pauses, thinking)* Lots of thrushes dropping in early.

EXPERIENCED BIRDER: Sounds great. Gray-cheeked is a real prize, you know. Couldn't have gotten it without these. *(he points to his binoculars)* Unbelievable binos. Crystal clear! Have you seen them yet? They're new.

YOUNGER BIRDER: *(not looking up, still concentrating on the bicycle lock)* Yes.

EXPERIENCED BIRDER: *(taking off his binoculars; offering them)* Go ahead. Try them. (*the younger birder stands; takes the binoculars, examines them; tries to hand them back. The experienced birder smiles; encourages*) No. Go ahead. Look through them. You won't believe it. (*the younger birder obliges*)

YOUNGER BIRDER: Nice. *(he starts to hand them back; hesitates; looks up, searching the sky, then trains the binoculars on a trio of high flying birds)*



EXPERIENCED BIRDER: *(looking up; squinting)* Swallows?

YOUNGER BIRDER: Two Nashvilles and a palm.

EXPERIENCED BIRDER: *(not listening)* Probably tree swallows. Wonderful glasses, aren't they?

YOUNGER BIRDER: *(handing back the binoculars)* Yes.

EXPERIENCED BIRDER: *(beaming)* Thanks. Knew you'd like them. I'm getting another pair for my wife. When we went to Antarctica last July her binos kept fogging. Ever been to Antarctica? Hell on equipment. You spend that much on a trip, you should have first-rate equipment.

YOUNGER BIRDER: No.

EXPERIENCED BIRDER: *(startled)* What?

YOUNGER BIRDER: No. I've never been to Antarctica. You asked me.

EXPERIENCED BIRDER: *(at ease again)* Oh, right. Well, when you get to Antarctica, remember what I said about equipment. Don't cut corners.

YOUNGER BIRDER: *(suddenly alert; searching)* Yellow-bellied flycatcher.

EXPERIENCED BIRDER: Did you say yellow-bellied flycatcher? *(the younger birder nods but doesn't answer)* Where?

YOUNGER BIRDER: I'm not sure. Somewhere in those trees over . . . *(he brings his binoculars up, a reflex as fast as a knee being assaulted by a hammer)* There it is. Perched in the sunlight . . . flying now.

EXPERIENCED BIRDER: *(bringing his binoculars up too late)* I didn't get on it. Why did you think it was a yellow-bellied?

YOUNGER BIRDER: It called.

EXPERIENCED BIRDER: But you didn't see a yellow belly?

YOUNGER BIRDER: *(hesitating)* No. It was an adult with very worn plumage.

EXPERIENCED BIRDER: *(nodding sympathetically)* Too bad you didn't get a good look at the belly. That's where quality optics really pay off. Like that gray-cheek this morning. Right in the shadows. Did you say that you saw one, too?

YOUNGER BIRDER: No. I said there were a lot of thrushes dropping in before dawn—mostly gray-cheeks and Swainson's.

EXPERIENCED BIRDER: It's tough telling gray-cheeks from Swainson's, isn't it?

YOUNGER BIRDER: *(perplexed)* More from wood thrush, I think. Attenuation is sometimes a problem with distant gray-cheeks, but . . .

EXPERIENCED BIRDER: *(breaking in)* Oh, wood thrushes are easy to tell from gray-cheeks. Much more spotted on the breast. Course, you need good optics. *(he looks at his watch)* Sorry, gotta run. Nice talking to you. Keep working on those thrushes. Takes practice.

The experienced birder gets in his car, closes the door, waves, then drives away. The younger man watches for a moment, then bends down and finishes unlocking his bicycle. He smiles.

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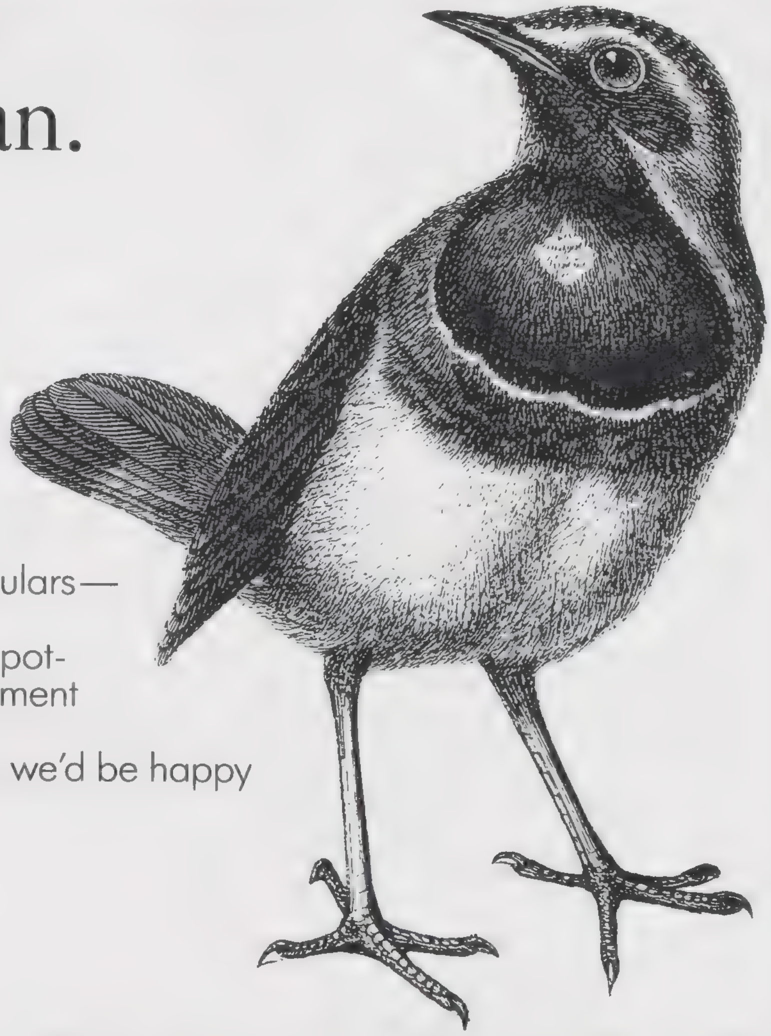

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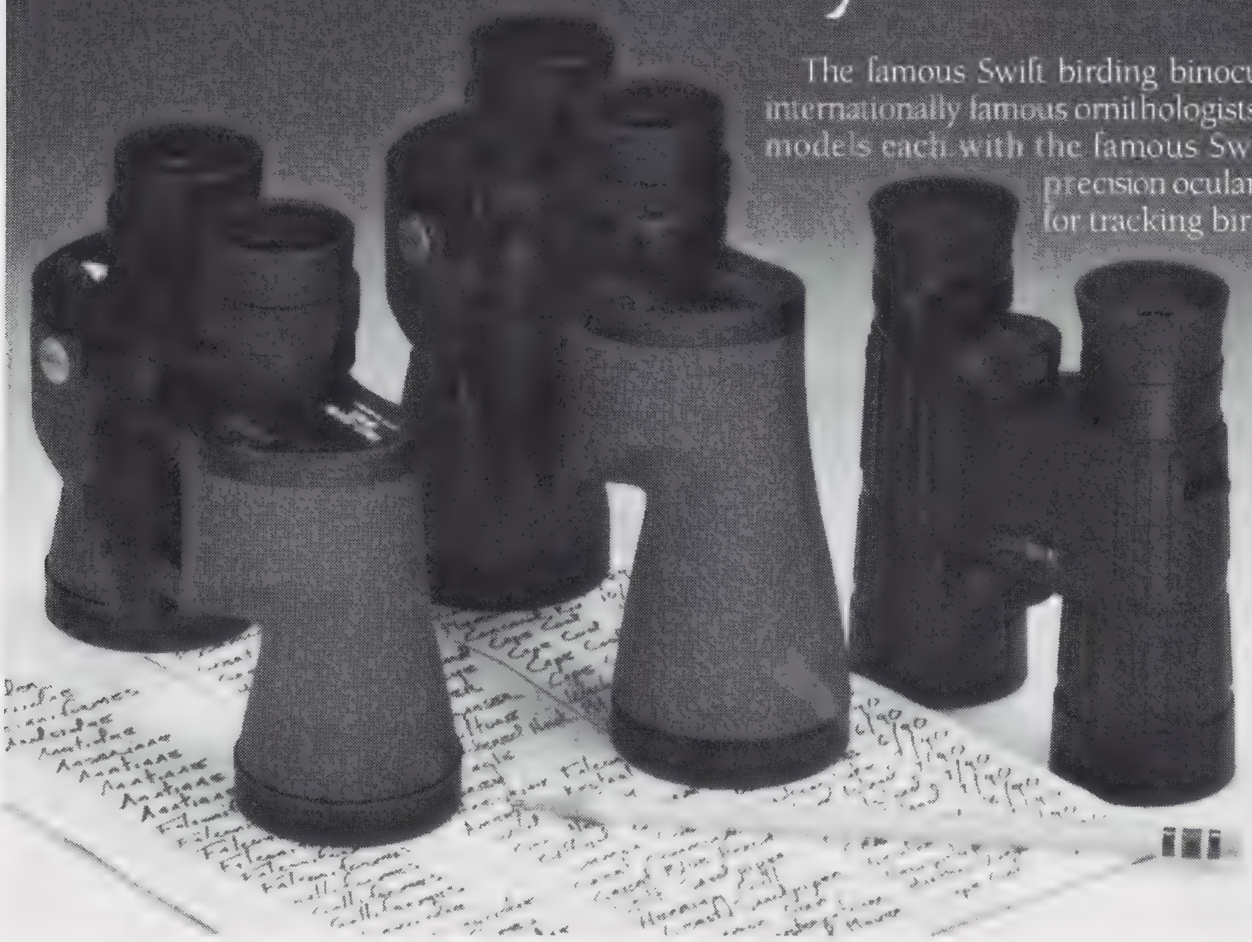

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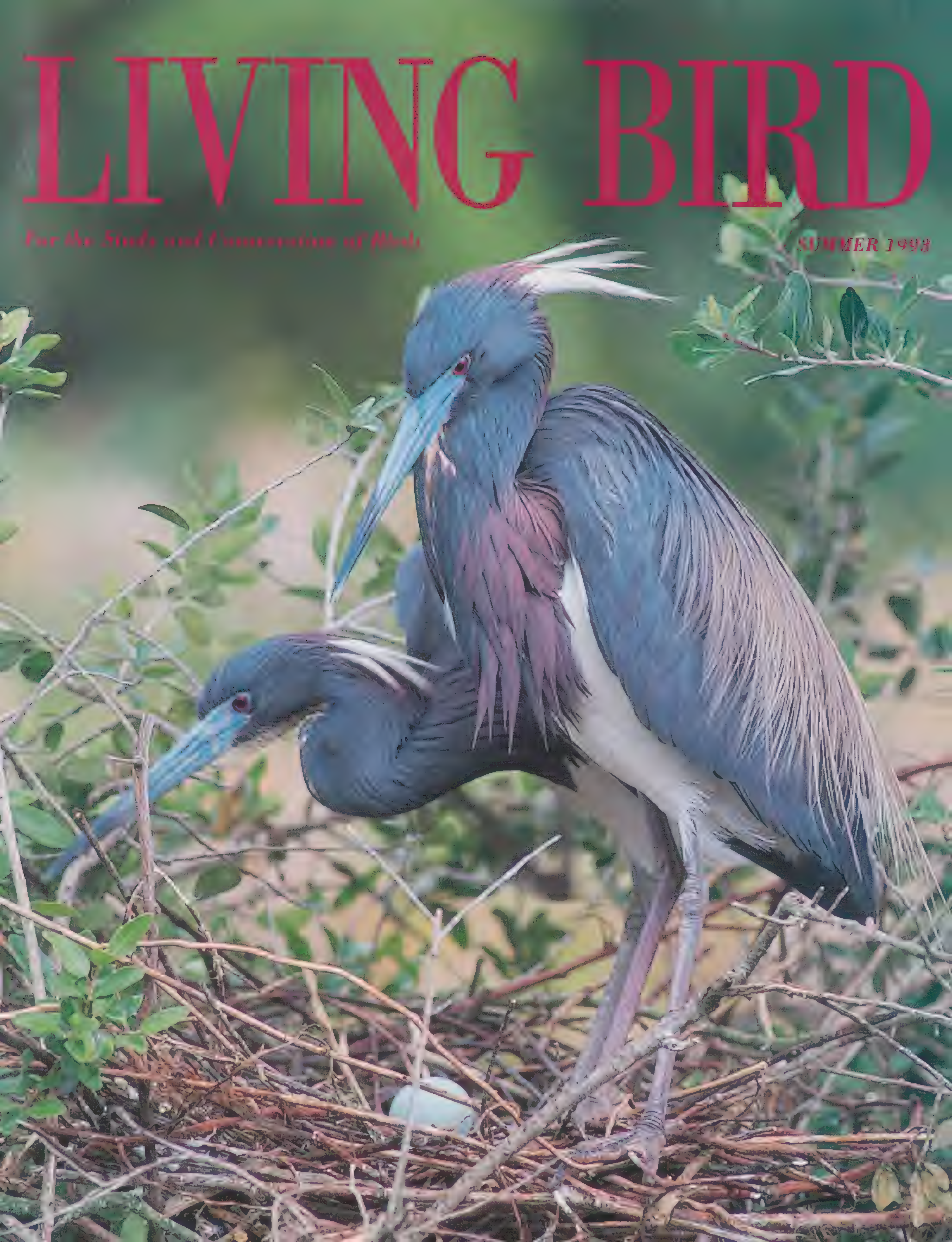

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LIVING BIRD

SUMMER 1993 VOLUME 12 NUMBER 3

Greetings from Sapsucker Woods

After a long, cold winter and a bleak spring, the sun is finally shining on Sapsucker Woods. It's a welcome change.The "Great Blizzard of '93" slammed into Ithaca on March 13, burying our parking lot and leaving deep snowdrifts against the Lab building. At a time when we all should have been celebrating the end of winter, we were digging out from the deepest snow in years.

The blizzard paralyzed the entire area for days, but it was not to be the last snow storm of the year for us. In mid-April, another storm hit, turning Sapsucker Woods white again and forcing a northward-migrating common loon to make an emergency stop at the sanctuary. This was a rare event—the second time in the Lab's history that a loon had landed on the pond.

Unfortunately, our pond turned out to be a difficult place for the bird to leave. Loons cannot make steeply angled, nearly vertical takeoffs like dabbling ducks. They need long stretches of open water to build enough speed to become airborne. Not only is our pond small, the Lab building sits at one end, and trees line every shore.

It seemed as though the loon might be stuck here. Each time it tried to fly away, the frustrated bird had to abort its takeoff to avoid plowing into trees. Then, early one morning, the loon left the pond and scrambled into our parking lot.

Lab general director Scott Sutcliffe was just arriving for work. Luckily, Scott has had a great deal of experience with loons—he was formerly director of the North American Loon Fund.Quick as a flash, he picked up the bewildered bird and wrapped it carefully in his jacket.

After ensuring that the loon was not injured, Michelle Bower of the Lab's membership department drove Scott and the bird to nearby Cayuga Lake. They released the loon and watched as it swam away. Just before they left, the loon shook its feathers, flapped its wings, and let out a tremendous tremolo call that echoed over the lake.

— *Tim Gallagher, Editor-in-Chief*

***Cover:** An Everglades family portrait—two tricolored herons stand guard over their newly laid egg. Read more about the fascinating wildlife and habitats of the Everglades on page 26. Photograph by Bobby Harrison.*

***Right:** A Madagascar jewel, this diademed kingfisher hunts from a limb next to a tiny forest pond. For more on Madagascar, see Frans Lanting's photoessay on page 20. Photograph by Frans Lanting/Minden Pictures.*

***Back Cover:** "Get out of town!" These meerkats show their strength in numbers, chasing a startled bateleur off their turf in the Kalahari Desert. Photograph by Charles G. Summers, Jr.*

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts.

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Printing by Cayuga Press, Ithaca, New York
Color separations by Brodock Press, Inc., Utica, New York

Letters

TAMPERING WITH TAILS

UDO SAVALLI

Regarding "A Tail of a Tail" (Winter 1993): If birds' tails are artifically lengthened or cut short, might that affect the function of flight and the ability to defend territory? It seems to me that the lengthened tails must be heavier and the shortened ones may have less wind resistance.

Also, might the females smell or somehow sense the glue and be repelled? How can anything be learned about natural selection when nature has been tampered with?

Alice E. Bisk
Far Rockaway, New York

Researcher Udo Savalli responds: Male widowbirds in *non**breeding plumage have short tails; the long, breeding-plumage tail probably hinders flight because of increased weight and drag. The males with experimentally shortened tails should have been, if anything,* better *flyers, and thus better able to defend their territories. In my study, however, short-tailed birds were more likely to lose their territories.*

Most birds have a poor sense of smell, so it is unlikely that the glue scent repelled females.

Because nature is so complex, tampering with it is often the only way to understand how it works. By changing the birds' tail lengths, I increased the variability of a trait, thus making the effects of the trait easier to measure.

WHAT'S IN A NAME?

In "On Being Systematic" (Winter 1993), Kevin McGowan states: "Scientists around the world . . . refer to the same species by its two-part, 'Latin' name." This is not altogether true. The genus is usually in Greek and the species is usually in Latin. If a proper name is used for the species it is usually Latinized English.

Owen Fang
Pensacola, Florida

Kevin McGowan replies: You are correct in stating that Greek is often used, although it is usually Greek transcribed into Latin. No requirements exist, however, for the genus name to be in Greek and the species name to be in Latin. Greek, Latin, Latinized English (or other languages!), or even newly created words are all acceptable for these names. In fact many species have the same name for both genus and species (e.g., Cardinalis cardinalis*).*

CAN WE GET THERE FROM HERE?

I was intrigued by Len Wolgast's Christmas tree farm ("Christmas Trees for the Birds") in the Winter 1993 issue. It sounds like a wonderful place to visit, but you didn't reveal where it is located in New Jersey. If it's all right with Mr. Wolgast, I would love his address and directions.

Mary Louise McColpin
Rowayton, Connecticut

Please call (908) 873-3206 during normal business hours to arrange a visit.

THANKS FOR NOTICING

This is just a note to tell you that I found the Winter 1993 issue especially good.

It seems to me there is a niche for a bird magazine to do the job *Scientific American* attempts to do for science generally—make advances in the field accessible to nonprofessionals. I do not believe other bird magazines have that goal, except incidentally.

Harold Mayfield
Toledo, Ohio

We welcome letters from readers.
Address letters to: The Editors,
Living Bird, 159 Sapsucker Woods
Road, Ithaca, New York 14850.

BirdNews

GENDERED PERSPECTIVE

A single mating can fertilize all of a female bird's eggs, so why do some pairs copulate as many as 600 times? Marion Petrie of Oxford University thinks that a common explanation—males whose mates have been unfaithful are trying to dilute the competitor's sperm—neglects the feminine perspective. Asking, "What does a female stand to gain from multiple matings?", Petrie argues that she's using sex as a form of mate-guarding (*Animal Behaviour,* vol. 44:790-92;1992). Petrie's studies of peafowl showed that hens are most likely to engage in multiple matings when female competitors are nearby—perhaps sexual favors keep mates from straying.

IT'S A BIRD

Until recently many scientists considered 150 million-year-old *Archaeopteryx* the "missing link" between dinosaurs and birds. Past studies of existing fossil skeletons suggested that the creature was a ground-dweller and chased after prey on foot. A new study by Alex Feduccia of the University of North Carolina contradicts this perception (*Science,* vol. 259: 790-792;1993).

Feduccia compared claw curvature in the *Archaeopteryx* fossils to 500 species of modern birds in three groups—ground dwellers, perching birds, and trunk climbers. Trunk climbers such as woodpeckers had the most strongly curved claws; ground dwellers had slightly curved claws. All of the *Archaeopteryx* claws resembled the moderately curved claws of perching birds.

Feduccia points to other evidence supporting the hypothesis that *Archaeopteryx* was a capable flyer and percher. For example, its asymmetrical flight feathers are essentially identical to those of modern flying birds. *Archaeopteryx* shouldn't be considered a primitive link, says Feduccia: "It was, in the modern sense, a bird."

A LOFT-Y CONCLUSION

In 1978, Lab executive director Charles Walcott reported that homing pigeons became disoriented when he released them at magnetic anomalies (localized irregularities in the Earth's magnetic field) in Lincoln, Massachusetts. The birds had trouble homing even under sunny skies, when he expected them to be able to use the sun as a compass. The finding supported the idea that pigeons can use the Earth's (usually predictable) magnetic information to navigate.

When Walcott released pigeons from his Cornell loft at a New York anomaly, however, they flew unhesitatingly homeward. His investigation of this unexpected behavior recently appeared in the *Journal of Experimental Biology* (vol. 170:127-141; 1992).

Cornell pigeons were also unaffected by the Massachusetts anomalies, suggesting that their homing ability was either genetic or a function of where they had been reared. So Walcott and his colleagues decided to stock a Lincoln loft with Cornell and Massachusetts birds for further tests. Because their old loft site—at Fox Ridge Farm—was unavailable, they placed their new loft 1.5 miles north at Codman Farm.

In tests at the Massachusetts anomalies, however, the Codman pigeons were as well-oriented as the Cornell birds. Apparently nothing in the genetic makeup of the Massachusetts birds determined their homing ability.

The researchers then established a second loft very near the original Fox Ridge site, raised sibling pigeons at Codman Farm and this new loft, and released them at the Massachusetts anomalies. The Codman pigeons flew straight home, while their Fox Ridge siblings were disoriented. Clearly loft location determined whether birds were disoriented at the anomaly—and a distance as short as 1.5 miles made a difference.

Walcott concludes that pigeons raised in different lofts learn to use different cues in homing. "It's analogous to the way people who grow up in cities learn to orient themselves using street patterns and skyscrapers, while people in the country might learn to use the position of the hills to get oriented," he says.

LEE SNYDER

Walcott launches a test pigeon.

OPERATION OVERFLIGHT

Top-secret technology is now a tool for ornithologists. U.S. Fish and Wildlife Service (USFWS) biologists have successfully monitored roosting sandhill cranes along the Platte River in Nebraska using a formerly classified aerial reconnaissance system that's mounted on Phantom jets.

Ordinarily, the Nebraska Air National Guard's tactical reconnaissance group trains for combat by collecting images of such heat-radiating objects as grazing cows. After the system was declassified in 1989, USFWS biologist John Sidle asked that the sensors be focused on the cranes.

The USFWS needed to count the cranes—and find out where they were roosting—to determine which riverside tracts should be protected for the birds. Each spring, half a million sandhill cranes use the Platte as a staging ground on their way to northern nesting areas.

The military technology worked well; individual cranes were readily visible, says Sidle, who adds, "The Guard acquired their necessary training while we got a valuable tool for our Platte River conservation efforts."

COMPILED BY CYNTHIA BERGER

In the Field

THE SHELL GAME

by *Jack Connor*

What does shell-dropping behavior tell us about the intellectual life of gulls?

The gull I'll call Chocolate caught my eye because she was a heavily marked juvenile—one of the darkest herring gulls I've ever seen—and because she was standing on the North Dike of Brigantine Refuge while shellfish rained down all around her. Dozens of older gulls were plucking mussels from the marsh, flying with them in their bills to the edge of the road, dropping them from 20 or 30 feet, and then descending to shake the meat free from the shattered shells. Chocolate stood at the center of the bombardment, looking right and left as the mussels cracked open or bounced. I counted 42 drops in 10 minutes, several of them within 5 yards of Chocolate's position.

Shell-dropping is a year-round activity for herring gulls on the North Dike when the tide is low. Juvenile/first-winter gulls do not participate, however—at least not while I'm looking. And I wouldn't have said that Chocolate was participating. While one gull after another descended to feed or picked up an unbroken shell to drop it again, she only eyeballed them, occasionally shuffling a few steps toward the nearest birds as if she might bluff them into abandoning their catch. I let my eyes drift away as a line of tundra swans passed overhead, and when I looked back, Chocolate was gone.

Scanning for her, I counted 127 gulls in the area, most of them older birds foraging in the tussocks of salt grass. Their primary prey here are Atlantic ribbed mussels, which cluster low in the sand and are exposed only at low tide. Shell-dropping involves a sequence of steps, each requiring different skills and all necessary for success. The gull must find a mussel (not an easy task when the marsh is scoured at every low tide by hundreds of competitors), yank the mussel loose, balance it horizontally in its bill, fly upwind to the drop site, hover high enough above the road so that the drop will break the shell but not so high that other birds can steal the prey, drop the shell accurately (allowing for the wind), descend to manipulate the broken shell (using the bill only—gulls don't hold prey with their feet), and feed.

Five minutes after she'd flown off, here came Chocolate back toward the road with a mussel in her bill. It looked laughably small—a cigarette to the other gulls' cigars. And where the other gulls rose upward above the road before they dropped, Chocolate stayed low, hovering 4 or 5 feet above the dirt, wings flapping heavily. Shell still in bill, she broke out of the hover, looped over the road twice, and hovered again, wings beating.

When she finally dropped her catch from 2 yards above the ground, the little shell hardly bounced. Chocolate descended, inspected it, lifted it up again, dropped it again from the same height, descended once more, looked it over, and abandoned it there. She walked away, resuming her position in the center of the road.

What had I witnessed? A more careful observer might say, "Nothing you can be certain of. You can't even be sure it was the same gull both times." But I have a romantic streak in me, and I think I saw a bird on the verge of an intellectual

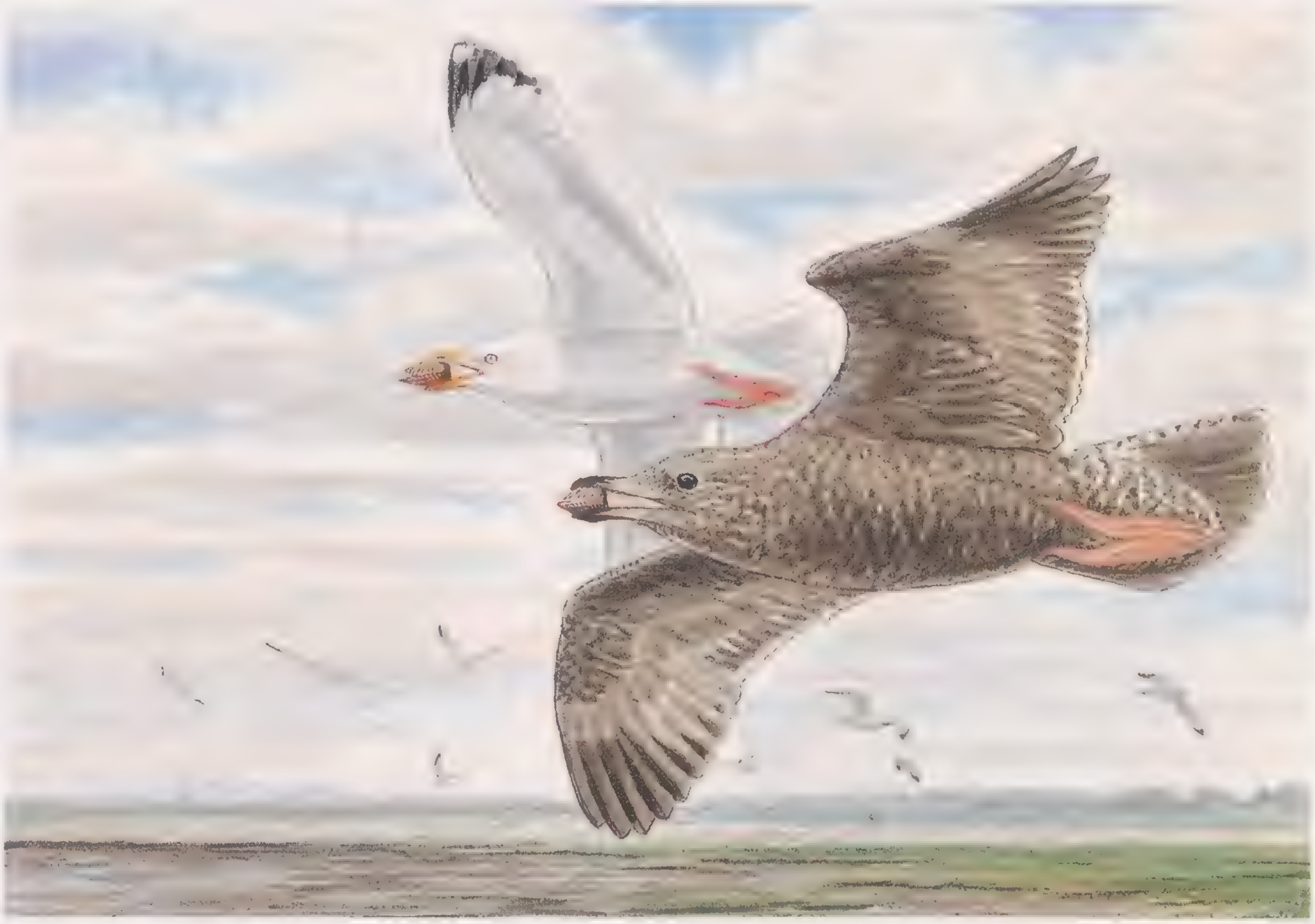


ILLUSTRATION BY JOHN SCHMITT

breakthrough. Chocolate knew all the steps—locate, pluck free, balance in bill, fly upwind to drop site, hover, drop, inspect, drop again. She had only to execute the steps correctly: she needed to select larger prey and to risk longer drops.

Nobel prize winner and pioneering ethologist Niko Tinbergen gives only three pages to shell-dropping in his classic 1953 text, *The Herring Gull's World.* Although he studied herring gulls with sharp-eyed attention and saintly patience over several decades, discovering much of what we know about their feeding, mating, and breeding habits, Tinbergen remained skeptical that shell-dropping was an example of intelligence or even learned behavior. According to Tinbergen's view, the gull's carry-and-drop was only an instinctive reaction to the shellfish's hard surface, which was a "releasing stimulus" in his terminology. Tinbergen was so convinced that this stimulus-response pattern explained the behavior that he ended his analysis of shell-dropping with a third-hand account that fits his theory but which I believe many birders would consider dubious.

It is the story of a mysterious plague of broken skylights at a West London factory in the winter of 1948, reported by a man who had heard the tale from the factory's safety inspector. Vandals were suspected, but the inspector claimed the skylights were being smashed by black-headed gulls that were swooping to the ground, picking up nuts, bolts, and pieces of scrap iron, and then flying high to drop the objects through the windows. If hard objects "release" the shell-dropping instinct in gulls, then this story is credible. If shell-dropping is intelligent, learned behavior, the story sounds like a cover-up.

I can't help wondering whether Tinbergen's understanding of shell-dropping developed by happenstance. He did most of his gull watching along the rock-free beaches of the Netherlands' North Sea shoreline. Shell-dropping, he notes, "does not work very well on the sandy coasts where I have studied gulls." Even where stone dams had been built on the shoreline, he seldom saw gulls successfully execute the sequence: ". . . the gulls apparently never learn to drop the shells here, nor do they seem to learn not to drop the shells above the water . . . Once I watched an immature gull dropping a shell into water thirty-nine times in succession."

In the mid-1970s, a quarter-century after Tinbergen, the American ethologist Benjamin Beck studied shell-dropping on the rocky shores of Cape Cod and concluded that it involves intelligence, behavioral adaptability, and careful observation of the old by the young. Among other evidence of learning, he found that adult gulls are more proficient than subadults (dropping more often and more accurately), and that juvenile/first winter gulls account for only about one drop in a thousand. Juvenile birds often play in the air with soda cans and other flotsam, however, and sometimes fly in tight, tandem flight with adults carrying shells. Occasionally, the adults allow the young to have the shells they have broken open.

In his intriguing book, *Animal Tool Behavior,* Beck compares shell-dropping to the termite-fishing of chimpanzees (who use tree branches to probe into termite mounds). Obviously gulls are not as intelligent as chimps, but in Beck's opinion shell-dropping and termite-fishing "provide equally strong bases for inferring such advanced cognitive processes as extended concentration, purposefulness, selectivity, premeditation, imagery, plasticity with regard to subtle variations in environmental conditions, and strategies." Beck suggests that, as in chimp populations, "cultural" differences may be a factor among gull populations—younger birds need to watch older birds who have mastered the technique.

Gulls who do not grow up surrounded by shell-droppers, it would seem, may never perfect it. The lack of a shell-drop "tradition" on Holland's North Sea might explain why Tinbergen's gulls did not use the stone dams—and why his 39-drop immature gull sounds a long way from Chocolate's level of development.

Tinbergen might not have been so surprised to learn of a "cultural" component in shell-dropping. He discovered and described similar (and more subtle) distinctions in the earthworm-hunting techniques of two gull colonies in Holland, and he notes frequently throughout *The Herring Gull's World* how new observations of previously overlooked behaviors had changed his understanding of his favorite bird. He was an observer who was always willing to take another look at the animals around him—even an animal he knew better than anyone else.

"Nature makes numerous experiments for us," he wrote, "and it is amazing how much evidence one can collect if one is continuously on the alert and appreciative of the possibilities." ■

Have you seen gulls dropping shells?

I'd be very interested to hear from readers in different areas of the country. What species have you seen executing this technique? Has anyone seen a hooded gull—laughing, Franklin's, Bonaparte's, or black-headed—drop a shell? And how about the outliers of the herring gull complex—the ring-billed, California, and great black-backed gulls? I would also like to hear from inland readers. Do gulls drop shells away from salt water?

What airplay or "mistakes" have you seen—has anyone seen a gull drop a metal object? Drop a shell on a car or window? I have never seen a herring gull drop a shell on a car on the Brigantine dikes, though traffic is heavy there and shell-dropping frequent, but several nonbirders I know claim to have seen cars get dented by "those stupid sea gulls."

I would be particularly interested to hear from any reader who lives near a drop site that has been in existence only 5 or 10 years—a new jetty or road near a shellfish source. Were there as many drops the first year as there are now? Or have you seen an increase as the "tradition" develops? Are there undiscovered drop sites in your area—places where gulls could find and drop shells but don't? Finally, have any of our readers been in Holland recently? Have the herring gulls learned at last to drop shells on the stone dams in Tinbergen's old territory? Let's hear from you.

Write c/o *Living Bird,* 159 Sapsucker Woods Road, Ithaca, New York 14850.

—Jack Connor

The Shrinking Kingdom of the Quetzal

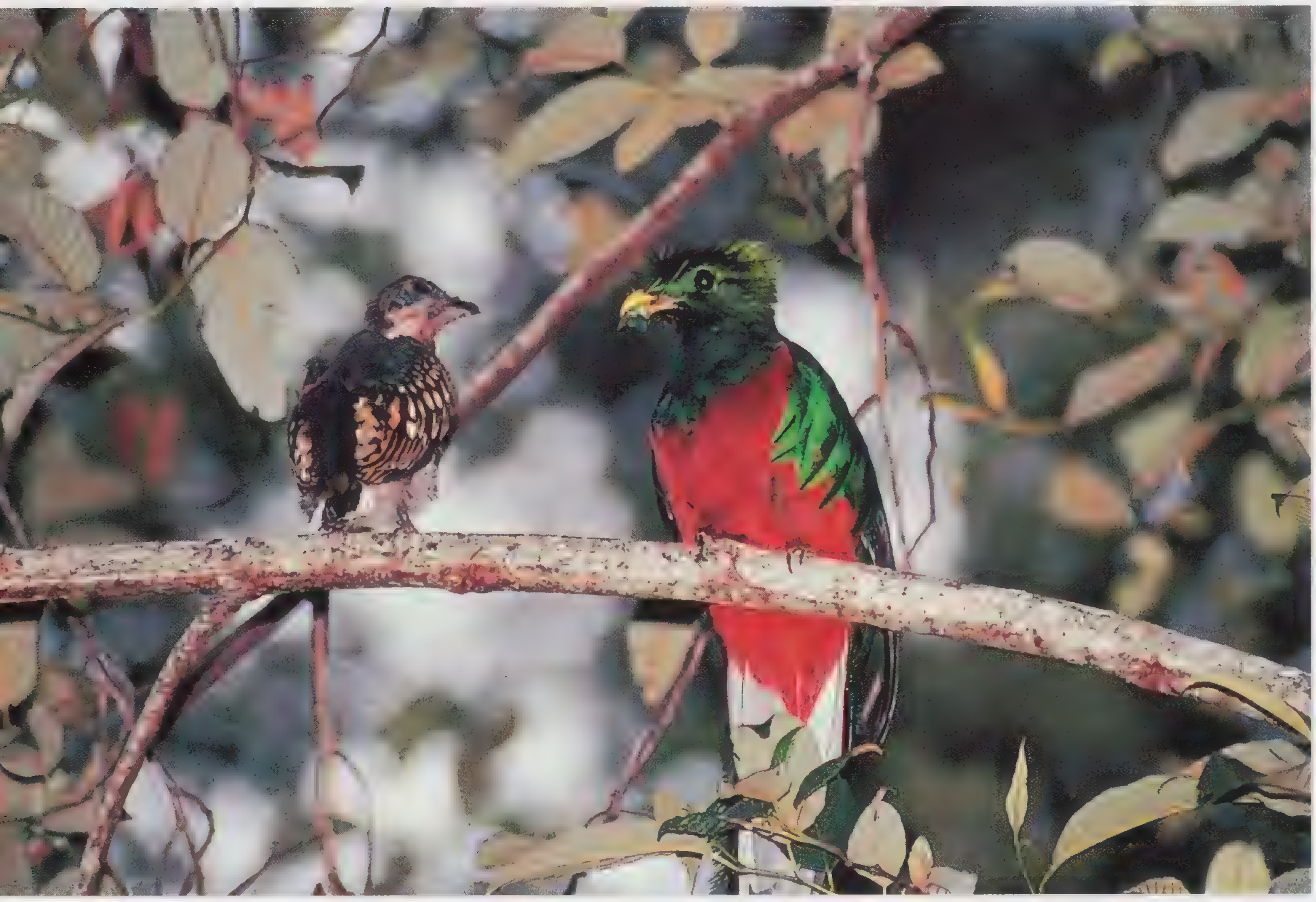
by Chris Wille

Photographs by Marco Saborio

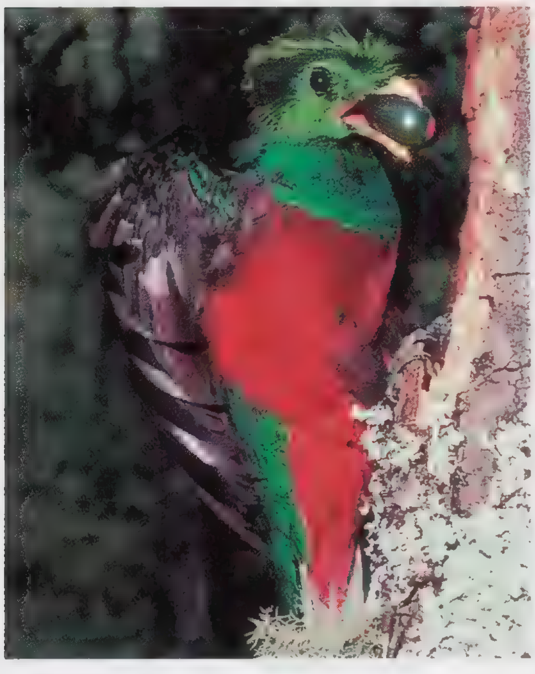
With its long, glittering plumes, the resplendent quetzal has always lured pursuers deep into the rainforest. People have followed the bird with delight, reverence, and simple covetous intent. Now, a team of scientists is tracking quetzals in order to learn how to save them. In the process, they are redefining the concept of wildlife refuge.

The kingdom of the resplendent quetzal extends from southern Mexico down the volcanic spine of Central America to the narrow waist of Panama. This bridge between continents was once robed in the finest greenery, from steamy lowland rainforest and hot, dry tropical forest to cool and breezy cloud forest.

Preserving mountain cloud forests alone may not be enough to protect this stunning trogon



An adult male quetzal, at right above, feeds a fledgling. Below, an adult male quetzal with a favorite food—a piece of fruit from a tree in the laurel family. The agile resplendent quetzal often plucks fruit from trees while flying.



The quetzal reigned from the ethereal heights of the montane forest, worshipped by the pre-Columbian inhabitants of Middle America—Aztecs, Toltecs, Mayas. Then the Spanish conquistadores came seeking gold and souls. The great native civilizations tumbled, and the isthmus was transformed.

At first, these events probably meant little to the quetzals. As the Native American populations declined, perhaps fewer quetzal plumes were needed for ceremonial dress. Though Europeans shot quetzals for sport and curiosity, they were too busy conquering their new territory to bother much with a gaudy trogon. Even Linnaeus ignored the bird, and it was not given its scientific name, *Pharomachrus mocinno*, until 1825.

By this time the quetzal, like most wildlife in the region, was feeling the effects of monoculture farming techniques. First the middle elevations were stripped of their forests for coffee. Then the lowlands were razed for bananas. Finally, in decades just past, with human populations and foreign debt growing out of control, most of the remaining forest was slashed to create cattle pasture.

The quetzals' mountaintop retreats became islands in a rising sea of deforestation. Few forests remain in Central America except in gorges and on steep pinnacles. Since most scientists thought these lofty outposts were prime quetzal habitat, they considered the bird to be relatively safe.

But some scientists now question whether saving summits alone is enough to save the quetzal. New studies prove that the bird breeds in the cloud forests, but then moves downslope into the unprotected lowlands. Many other rainforest beauties follow similar patterns, including the bellbirds, cotingas, toucans, macaws, umbrellabirds, and even the tiny, jeweled hummingbirds.

A team of ornithologists and technicians is mapping the quetzals' movements to learn which habitats outside the cloud forest are essential for the birds' well-being. The mission, according to project leader George V. N. Powell, is to "help conservationists design viable montane reserves in the Neotropics."

The scientists are studying the world's most famous flock of quetzals at the Monteverde Cloud Forest Preserve, Costa Rica's best known ecotourism attraction. The vividly green quilt of Monteverde drapes over the Continental Divide in the northwestern quarter of the country, nearly surrounded by cattle pasture and other agriculture. Deforestation continues to eat its way up the slopes toward the refuge.

The village of Monteverde was founded by Quakers who left the United States in the 1950s seeking a tranquil place to practice their traditional lifestyle, which centers on family, community, and peace. Most of the settlers cleared pastures for dairy cattle, and Monteverde cheese became a Costa Rican staple.

About two decades ago, a young biologist wandered into Monteverde and was immediately enchanted by the cloud forest. He began fund-raising efforts for what would eventually become the Monteverde Cloud Forest Preserve. That idealist was George Powell.

Today pilgrims from around the world, carrying binoculars and field guides, make the long, jarring drive up the mountain to Monteverde. They come to explore, to admire, to fill their senses with the mad photosynthesis of a virgin cloud forest. But most of all they come to see quetzals. In 1992, more than 49,000 ecotourists breathed the mists of Monteverde's trails. Each year, the number of visitors increases by 15 percent.

The sanctuary is not part of Costa Rica's famous park system. It is privately owned and operated by the Tropical Science Center, a Costa Rican research organization. Monteverde was purchased, acre by acre, by thousands of individual donors and conservation groups such as the World Wildlife Fund, The Nature Conservancy, and the Rainforest Alliance. A local group, the Monteverde Conservation League, strives to expand the preserve and has enlisted the aid of children around the world, who have donated funds to create the Children's Rainforest. About 25,000 hectares (61,750 acres) are now protected.

But George Powell fears that Monteverde may not be large enough to guarantee the survival of the quetzal. Powell, director of conservation biology for the Rare Center for Tropical Conservation, has studied the wading birds of Florida Bay and migratory birds throughout the Neotropics. He was one of the first biologists to point to tropical deforestation as a primary cause of declining populations of Pan-American songbirds. The quetzal research, Powell says, aims to "develop a methodology to identify habitats critical to the survival of altitudinal migrants, and to train Latin American scientists in the use of this methodology." The project is now in its fourth year.

Even though the quetzal is one of the most admired and sought-after birds, little is known about its natural history. Quetzals breed at elevations above 4,500 feet from March through July, excavating nesting cavities in rotten snags. Around August, breeding complete, the quetzals disappear from Monteverde.

Part of the quetzals' mystique, Powell says, "is their ability to disappear when the breeding carnival is over." Somehow they can blend into the forest canopy, despite their plumage, which Powell describes as "a magnificent kaleidoscope, capturing the sun and creating bursts of shimmering greens, reds, and golds—nature's own lasers."

Powell and other biologists knew that the quetzals were migrating, probably in search of food, but nobody knew where. To end the guessing, Powell called on the biologist's high-tech friend, radiotelemetry. And then he called on his colleague, Audubon scientist Robin Bjork, who had become a skillful telemetry technician by tracking roseate spoonbills around Florida Bay.

The two captured quetzals in nest trees and in mist nets suspended in front of feeding trees on 40-foot poles. Bjork selected a transmitter weighing 6 grams—just 3 percent of a quetzal's body weight. She devised a backpack harness of light Teflon ribbon held together with cotton thread. In the eternal damp of the cloud forest the thread rots in a year or so, and the transmitter drops off.

With portable receivers and hand-held antennae, the team was able to monitor the movements of the bugged quetzals in the Monteverde area. When the birds disappeared, Powell and Bjork rented a small plane with an ace pilot. Finding the open air between cloud and mountain while tracking faint quetzal beeps requires aerobatics that would test the nerves of Chuck Yeager. But these heart-in-throat flights quickly paid data dividends.

The scientists learned that Monteverde's quetzals make two distinct downslope migrations, one on the Pacific side and another on the Atlantic, returning each time to their sanctuary on the Continental Divide. Now, with data from four years in hand, the unusual migration pattern is confirmed.

A map of the quetzals' range looks like an octopus with Monteverde at the center and long arms of habitat reaching down into the lowlands. "We now know," Bjork says, "that the altitudinal zone between 2,000 and 3,500 feet is critically important for this species. Unfortunately, that zone is being hit hard by deforestation."

Costa Rica has won international acclaim for its park system, which protects widely varied ecosystems and almost 12 percent of the nation's land. Ironically, the country also has a high rate of deforestation. Some conservationists fear that in five years the tiny, mountainous republic will have no significant wildlands outside of the parks. Minister of Natural Resources Hernan Bravo says, "We are the champions at absolute and total protection and absolute and total destruction."

This is what makes the quetzal research so urgent. Conservationists have to grab whatever habitat they can right now or lose it forever. And with limited resources, they have to be very selective. Knowing which habitats are necessary to sustain a species such as the quetzal helps the

Above, a nestling quetzal hunkers in a tree cavity. Quetzals raise their young in cloud forests high in the mountains, but when breeding season is over, the birds slip downslope to spend the rest of the year in lowland forests. This vertical migration pattern means that maintaining high-altitude preserves alone will not ensure that the quetzals are adequately protected.

La Tigra Journal

Vicente Espinoza migrates with the quetzals, moving his household from the Monteverde Cloud Forest Reserve to a village called La Tigra in the lowlands. I visited Vicente recently and learned that biology is more than an intellectual exercise. Here are some notes from my journal:

November 22, 1991: La Tigra is three hours' drive on bad roads northwest from the capital city of San Jose. Here in the foothills of the Tilaran Mountain range, conservationists have linked protected lands upslope to the lofty Monteverde Preserve. By following quetzals, Vicente discovers areas that may be essential to their survival and should be added to the sanctuary.

I find Vicente in the road while looking for his house. He is wearing rubber boots, jeans, and a slicker and carrying what appears to be a section of television antenna. Just in from tracking quetzals, he is drenched, muddy, and tired. Like most Costa Ricans, he is pleasant and a little shy.

CHRIS WILLE

Costa Ricans Vicente Espinoza, at right above, and Horacio Montero track radio-tagged quetzals, trying to map the limits of the birds' migratory movements.

We go to his simple, open-air house; creek and orange trees out back, vegetable garden in front. His wife, Zulay, is painting birds on T-shirts to sell at the preserve.

Vicente, 42, was a farmer. He was attracted to the project because of a natural affinity for wildlife and the forest. George Powell hired him because of this strong interest and his tireless dedication to quetzals.

November 23, 1991: We are up at five and eat quickly; oatmeal cakes, soft cheese, and coffee strong enough to rouse Elvis. Soon we are joined by Horacio Montero, Vicente's brother-in-law, and we head up the mountain. I quickly see the problem confronting quetzals and other wildlife. The flats are in agriculture, and the hills have been cleared for pasture. Scrawny cattle are grazing on slopes so vertical that they almost call for mountaineering gear. We don't find extensive forest until we reach the Children's Rainforest, managed by the Monteverde Conservation League.

It begins to rain as we plunge into the forest, following an old horse trail, crossing an area of steamy hot springs. The Arenal volcano is so close we can hear its belly rumbling.

Vicente and Horacio move quickly; they are traveling light. Vicente has the receiver in a special waterproof case designed by Robin Bjork. Horacio carries a knapsack and my tripod. They found a bird in this area yesterday and hope to locate it again.

The trail ends and the canopy closes in; we begin climbing a steep muddy slope. The rain continues. This goes on until my knees knock with fatigue.

We find a piece of orange surveyor's tape tied to a tree. Vicente reads the coded message. George Powell has been here before us and found a quetzal in this tree. I look up, searching the dark foliage. Everywhere, the pineapplelike plants called bromeliads perch on limbs, their long, lanceolate leaves hanging like quetzal plumes.

This tree is a wild avocado, in the laurel family (*Lauraceae*), Vicente says. Quetzals coevolved with *Lauraceae*, and the two species are interdependent. Quetzals eat the large-pitted fruity drupes of about 18 species of laurel, distributing the seeds.

Vicente picks up a signal and, like a miner with a Geiger counter, dives forward. We are crossing a deep ravine. Vicente sets a killer pace, threading the antennae through the brush as easily as a buck carries its antlers.

I slip and, despite Vicente's hissed warning, instinctively grab the nearest tree. It's a pejibaye, a type of palm with needlelike spines. My hand flashes with pain and then goes pleasantly numb, a reminder that many modern drugs, including an anesthetic used in surgery, are derived from rainforest plants.

At the bottom of the ravine is a spirited creek and waterfall. We splash our faces, already soaked with sweat and rain. A guan calls nearby—a sound like someone sharpening a machete on a stone. Horacio's machete sings softly up ahead, clearing away trouble for the clumsy journalist. We draw close to the quetzal . . . and then its signal flies back across the ravine.

An hour later we too are back across, and Vicente homes in on the bird. "There," he says, pointing. I don't see it. Vicente's binoculars are fogged inside. He takes them apart to clean the lenses with his shirt. Finally I find the bird, sitting motionless in the canopy, probably digesting a fruit. It is a thing of unqualified beauty. We watch it until it flies off, dropping backward off the branch the way quetzals do, supposedly to protect their elegant plumes.

Vicente makes notes in his journal. Another data point. More evidence that this habitat is vitally important. He consults the map. We are inside the reserve boundaries, but minutes later, as we are hiking out, we hear a cow bellow. Agriculture is closing in. This bird, like so much wildlife in Central America, is on the edge. —*Chris Wille* wildlife advocates choose wisely. "Mapping the quetzal's movements gives us a quick index to the habitats important to altitudinal migrants, which dominate the montane forest avifauna," Powell says.

Half the size of Tennessee, Costa Rica has an exceptionally rich flora and fauna—more bird species (850), for example, than all of North America. This biodiversity and the army-less country's strong democratic traditions make it the ideal laboratory for tropical conservation experiments. But the challenge of connecting essential habitats is the same in every country, so Powell and Bjork want to export the methodology of properly defining a wildlife sanctuary. They are organizing similar investigations in Guatemala and Honduras.

Two Mexican biologists have already been trained. One, Sergio Barrios, will continue studying altitudinal migrants, perhaps in the Monteverde area. Maria Lourdes de Alvilla, already a quetzal specialist, will use the tracking techniques she learned in Monteverde to assess the adequacy of the El Triunfo Reserve in Mexico.

In Monteverde, Powell is using the latest computer mapping systems to plot newly discovered quetzal corridors, then employing conservation's oldest technique: face-to-face discussions with landowners. Members of the quetzal team visit farmers who own land in the altitudinal flyways, encouraging them to spare or plant trees. The conservationists show farmers that trees protect water sources, provide a sustainable supply of wood, and serve as windbreaks.

The magnificent plumes of the male resplendent quetzal, above, have inspired awe for centuries. In pre-Columbian times the Aztecs, Mayas, and Toltecs of Middle America worshipped the birds and fashioned their long, elegant tail feathers into ceremonial headdresses for kings and other nobility.

Over time, Powell hopes to rescue enough habitat to secure the quetzal's future. Meanwhile, conservationists are learning to draw park boundaries that will ensure maximum biodiversity rather than political or economic convenience. And that knowledge will help save not only the quetzal but many living things.

Native Americans once considered the resplendent quetzal a divine being. Harming a quetzal was a crime punishable by death. Modern bird watchers still worship the creature. We try to understand its beauty. One team of researchers subjected quetzal feathers to laboratory tests, searching for the secret of their impossible iridescence. But even with magnification, chemical analyses, and polarized and ultraviolet light, they came no closer to an explanation than George Powell, who says that the quetzal is one of those wonderful examples of evolution gone wild.

Powell is content to leave the quetzal's mysterious powers and beauty unexplained. He just wants to know enough about the bird to save it. If we allow this resplendent species to slip through our fingers, he says, neither the spirits of the vanquished Native Americans nor our own descendants will forgive us. ■

Chris Wille is codirector of the Central American office of the Rainforest Alliance and a frequent altitudinal migrant from Costa Rica's Central Valley up to the Monteverde Reserve.

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PETER TURNLEY/BLACK STAR

Flag-waving crowds fill the streets of Prague, above, as the communist government of Czechoslovakia comes crashing down. In the late 1980s communist governments in Eastern and Central Europe collapsed like dominoes under the weight of their stifling, inefficient economic systems. But the new free-market systems replacing communism could prove to be a disaster for wildlife in the region.

AFTER *the* FALL

by Gerard Gorman

I have always been fascinated by two things: birds and irony. And now, after living in Hungary for more than eight years and birding extensively in the region, I find that birds and irony may have met. The irony is that as Eastern Europe changes from communism to a free market economic system it is becoming increasingly clear that perhaps, just perhaps, communism was better for birds.

Across Eastern Europe people are enjoying their new freedoms . . . but what will happen to the birds?

I have brought up this point with friends in the former communist countries on several occasions, often receiving looks of sheer amazement.

BHL

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For most of my friends hereabouts it is strange enough that I am a bird watcher. I mean, birders are real weirdos, aren't they? But for many, to suggest that communism was beneficial to anything at all is a kind of heresy. During these invariably late night discussions over glasses of the local *pálinka* or vodka, I always stress that I am arguing from the birds' point of view and presume that birds have no interest in ideology, only in their survival. And which birds do I argue on behalf of? Some of Europe's most threatened species, such as Dalmatian pelican, lesser white-fronted and red-breasted geese, white-tailed and imperial eagles, corncrake, great bustard, and aquatic warbler. All of these birds and many more have the bulk of their European populations in the former communist countries.

The truth is that the fall of communism in Eastern Europe has solved some conservation problems and raised others. It is a fact, however, that Eastern Europe has more wilderness areas than Western Europe and that this is due to the two opposing political and economic systems that prevailed from World War II to the late 1980s. From the point of view of the birder and conservationist, not to mention the birds themselves, it is crucial that the transformation of the region to a free market economy does not damage these wild places. Can the countries of the former Soviet bloc transform themselves into modern, affluent states within a free Europe without destroying precious wilderness areas that Western Europe has almost totally lost?

RAIMUND CRAMM/ BRUCE COLEMAN LTD.

An example will illustrate the point. Hungary and the former Czechoslovakia have few natural wetlands because lakes and marshes were systematically drained to provide agricultural land or converted to fish farms. These man-made pond systems are a veritable paradise for birds. Under communism the fish farms were run inefficiently, and no one worried how many fish were eaten by grebes, herons, and white-tailed eagles. Fish wastage during the autumn harvest drew birds by the score for an easy feast, and workers allowed reeds to spread freely, creating cover and nesting places for bitterns, egrets, spoonbills, harriers, bluethroats, and numerous warblers.

I recall a day at Hortobagy-halasto, a huge collection of fish farms in eastern Hungary. An area with open waters encircled by reeds and canals dotted with bushes, it is one of Europe's top birding sites. The fish farm workers were hanging around, waiting for a truck to come and take away a batch of fish they had scooped from the pond with a crane. Fish were everywhere, on the banks and floundering in the drained pond, as black-crowned night-herons, white storks, and great egrets lined the approach channel, steadily moving closer as they gained confidence. The workers eventually gave up waiting for the truck and retired under the willows for an unofficial lunch break, providing an opportunity the birds could not resist.

Unfortunately, the bird banquet I witnessed may never be repeated, because the Hungarian government is now encouraging the privatization of such fish farms. Private owners will undoubtedly introduce more intensive management, which will mean using artificial fish food, introducing faster-growing, alien fish species, removing reeds from the waterside, and using fertilizer in the water to produce algae—all of which will cause trouble for birds. In short, from now on the truck will arrive on time and the workers will care about the number of fish the birds take.

Another problem concerns the new managers, who rent or lease state fish farms on a short-term basis and think only of short-term profit. Their management strategy is bad for the ponds and for

BRUCE COLEMAN/ BRUCE COLEMAN LTD.

Far left, a great bustard performs its elaborate courtship dance on the Hungarian puszta. Some of Europe's most threatened bird species, such as the great bustard, at left, and the Dalmatian pelican, above, have the bulk of their European populations in the former communist nations.

birds. Since there is little alternative habitat for wetland birds in the area, the fish ponds of Hungary and the former Czechoslovakia are vital. A spring without the reeling song of Savi's warblers or the clamor of whiskered tern colonies doesn't bear thinking about.

Land ownership is a sticky topic in Eastern Europe. Many people are claiming back property confiscated from them or their families by the communists in the 1940s and 1950s. This could create problems for geese and other birds that sometimes feed in agricultural fields. Previously, farmers in Eastern Europe tolerated the crop damage caused by flocks of geese. Under the communist regimes, the farms did not belong to the people who tended the crops, and the state usually shouldered the cost of the losses the birds caused. In the near future, however, a farmer who owns the land himself will probably not be as tolerant when thousands of white-fronted or red-breasted geese visit his fields.

In January 1991 I visited the Black Sea coast in Rumania with some British and Rumanian birders. The vast fields of winter wheat there provide food for about half the world population of red-breasted geese. These are relatively new grazing grounds; the birds' historical wintering area was across the Black Sea in the former Soviet Union in areas that are now unsuitable. These rare and beautiful geese now choose Rumania and Bulgaria as their winter home. At the moment, the feeding fields I visited seem secure, but what does the future hold? It may be too early to say but one thing seems certain: a change in ownership or attitude will spell danger for the geese, since they probably have no suitable alternative wintering area.

In northwest England, where I grew up, farmers have been persuaded by the government to tolerate large flocks of wildfowl on their crops; they receive financial compensation for any damage the birds cause. But that is England. The new governments of Eastern Europe do not have the funds to pay farmers for bird-friendly farming. Now that the central authority of the communist system has collapsed, a policy of "hands off" government prevails, allowing new owners to do more or less as they please. Legislation has not kept pace with events. New laws for acquisition and ecologically sound management are urgently needed. Changes in land use, building schemes, road construction, and a rush for quick profits are all threatening the places where birds live. Bird habitats risk being sacrificed in the name of short-term economic interest.

The Biebrza Marshes in Poland are an internationally recognized bird area, with rare spotted eagles, corncrakes, great snipes, and aquatic warblers. Other inhabitants include wolf, moose, and beaver, all of which are nearly extinct in Western Europe. These vast marshes escaped the agricultural plans of the former regime mainly because draining such large areas had been beyond the technical and financial means of the Polish government. The traditional farming methods of the local population had developed in harmony with the wildlife of the marshes. But now large-scale investment in agriculture, drainage schemes, and tourism, which the communist government was unable to implement, may loom ahead. In a perverse way, the inefficiencies of the communist system often benefited birds and their habitats.

The newfound freedom to travel in the former communist countries may also be a threat to wildlife. Most of these nations lack the basic infrastructure required to cope with the increase in tourism, as hordes of sightseers flood into Eastern Europe. Over half a million secondhand cars

M. P. KAHL/BRUCE COLEMAN LTD.

from the West have been imported into Hungary since its borders opened. The effects on the environment can only be guessed. Sensitive areas like the Bavarian-Sumava Mountains may not be able to stand the expected rush of curious visitors. Even a brief visit to the Czech side of this rich area of forests and peat bogs illustrates the stark contrast between the wild, untouched lands east of the "Iron Curtain" and those in the West. Black storks, hazel grouse, eagle owls, and white-backed woodpeckers are specialities here. Wisely, the government in Prague acted quickly to make Sumava—formerly a closed military zone between East and West—a new national park. Would the black grouse and capercaillie leks of Sumava have survived if they had been outside the no-man's-land of the Iron Curtain? Will they survive now that they are no longer inadvertently protected by Warsaw Pact troops?

New frontier crossings have opened on the Austrian-Hungarian border around Neusiedlersee-Lake Fertö to cope with the increase in traffic since the barriers came down. A rise in tourism in this cross-border recreational zone means increased development, with golf courses and holiday homes planned for reedbed areas. Since the area contains over 200 pairs of great egrets and thousands of water rails, to mention just two species, this plan does not seem wise. Yet wisdom does not always govern development, as Western Europe has found to its cost.

A major task facing the new democracies is to learn from the errors of Western development. It is no coincidence that the number of great bustards on the Hungarian side of the border, formerly a closed military area, has always been higher than on the Austrian side. What now for this species, one of Europe's rarest birds? An entire network of depopulated border zones that provided a refuge for birds is now set to be developed. All over Eastern Europe, grasslands, marshes, and hill ranges that formerly served as practice grounds for the Soviet Army and its allies have been abandoned. The birds that found refuge in these sealed-off zones now await their fate as plans are made either to protect or develop the lands. The new roads and service structures needed for the former communist countries closest to Western Europe will also put pressure on many important bird areas in those countries.

One great irony of the situation is that these were the front-line states lined up against the envisaged Western invaders and now, albeit on friendly terms, the Westerners *are* coming! Because the border areas between East and West were closed to the public for more than four decades, a rich array of wildlife has survived and developed there. It would be a great tragedy for Europe to lose this natural heritage now.

Yet despite the many threats to birdlife that have arisen with the fall of communism, all is not doom and gloom. Some areas are being preserved as the new governments, under pressure from conservationists, rush through laws to establish nature reserves. Several areas of Hungarian *puszta*, a unique grassland-steppe, have recently been declared protected and cannot be sold. Thus some important habitat for great bustards, collared pratincoles, stone curlews, and red-footed falcons has been preserved. In addition, the future of the Danube Delta in Rumania, probably Europe's greatest wetland wilderness, is brighter now. Former president Nicolae Ceausescu had planned various schemes, such as converting the delta into agricultural land and creating a tourist complex. But now, after the fall of his regime, the delta has been set aside as a biosphere reserve. In the new climate of cooperation, international bodies are working hard to guarantee the future of the delta and its birds.

GEORGE McCARTHY/BRUCE COLEMAN LTD.

During the Cold War, the closed military zone between Germany and the former Czechoslovakia was a safe haven for black storks, far left, and other birds. In this case, fortunately, the birds will continue to find refuge: the new Prague government has turned the area into a national park. The vast fields of winter wheat in Rumania provide a foraging area for nearly half the world population of the rare red-breasted goose, above. Will the geese still be welcome as more and more of the lands become privately owned?

Having birded throughout Central and Eastern Europe before and after the fall of communism, I've acquired a wealth of memories: those red-breasted geese heading in from the Black Sea on a bitter January afternoon in Rumania, the dancing cranes at dawn in a Polish marsh, that rock thrush with his dazzling flight display in a Hungarian quarry, and that pygmy owl bobbing angrily atop a spruce in a Bohemian forest. I would much rather be fascinated by these birds again than by the ironies of change. ■

Gerard Gorman is international affairs officer at the Hungarian Ornithological and Nature Conservation Society, a free-lance birding tour guide, and the author of A Guide to Birdwatching in Hungary *and the forthcoming* Where to Watch Birds in Eastern Europe.

MADAGASCAR: The

Frans Lanting's remarkable photographs capture the spectacular beauty of this remote and fragile island

When Frans Lanting first traveled to Madagascar in the mid-1980s, the country was just emerging from a long period of political isolation. The island had not yet been studied in depth by 20th-century scientists and still contained many species yet to be discovered.

"It was as though the island's flora and fauna had been lost in a time warp," says Lanting. "Madagascar had not been explored in a modern sense. It was very exciting to be in the vanguard, providing the first documentation of species that had never before been photographed. In the course of my field work I actually photographed a species of lemur that hadn't even been named yet. It doesn't get any more exciting than that, sitting face to face with an unknown primate, alongside the scientist who discovered it."

But in addition to the incredible natural wonders of Madagascar, Lanting also witnessed rampant environmental destruction—slash-and-burn agriculture, massive deforestation. When viewed from

Photographs by Frans Lanting

BIRDSCOPE

The newsletter of the Cornell Laboratory of Ornithology ■ Volume 7, Number 3 ■ Summer 1993

LNS, Russian Archive Launch Collaboration

by Cynthia Berger

Russian and U.S. scientists shook hands at the Lab in an emotion-charged ceremony last November. Olga D. Veprintseva, curator of the Phonotheka of Animal Voices, and Greg Budney, curator of the Lab's Library of Natural Sounds (LNS), signed a memorandum of understanding stating that the two sound archives will seek funding to repair and restore the unique Phonotheka collection.

Veprintseva's husband, the late Boris Veprintsev, and his comrade, V. Leonovich, together recorded the majority of the sounds in the collection. The 8,500 recordings include almost 600 of the former Soviet Union's 750 bird species, including the rare ibisbill and little curlew. Veprintsev died in 1990, and the political and economic turmoil in Russia have made it difficult for Veprintseva to store the tapes under appropriate conditions; some of them have begun to deteriorate.

The Trust for Mutual Understanding, a Rockefeller fund dedicated to fostering international communication, provided the funding for Veprintseva and her associates—sound engineer Galina Diomina and interpreter Elena Smirenski—to travel to LNS; additional travel funds came from an anonymous donor. Now LNS and the Phonotheka are seeking additional funding to repair, restore, and copy the tapes. In exchange for providing technical expertise and facilities for the preservation work, LNS would be permitted to hold a copy of the Phonotheka collection and supply the recordings to users in the Western Hemisphere for research purposes.

A biophysicist who is remembered by the scientific community for his work to create a "gene bank" for endangered ani-

(continued on page 2)

TIM GALLAGHER

A token of international collaboration: LNS curator Greg Budney presents a compact disc to (left to right) Olga Veprintseva, Elena Smirenski, and Galina Diomina.

Bigger, Better *Birdscope*

This newsletter reminds me of my dog. It's nice to have around, but often it gets in the way. Open the last few issues of *Living Bird* and what do you see? The full-color center spread interrupted by our "Special Pullout Section."

Here's the good news: this is the last *Birdscope* to be stapled into the lovely pages of our magazine. Beginning with the Winter 1994 issue, both the newsletter and *Living Bird* will be delivered as separate publications inserted in one envelope.

If you're a longtime Lab member, you'll recall that *Birdscope* was formerly published separately from *Living Bird*, but was folded into the magazine as a cost-cutting measure. Does this mean the Lab is suddenly flush?

Unfortunately not. What it reflects is a decision to fold two Lab publications, *Birdscope* and *FeederWatch News*, into one.

This decision is not made lightly. Readers like *FeederWatch News*, and messing with success can be dangerous.

But recent and intensive evaluations of Project FeederWatch have revealed that most FeederWatchers, many of whom are not Lab members, want more news about our organization. One larger newsletter will provide that news and may induce more FeederWatchers to join.

At the same time, Lab members who are not FeederWatchers are missing fascinating information being uncovered each winter by our network of volunteer ornithologists. We hope that many of these folks will join FeederWatch once they learn what it's all about.

And, our improved and larger *Birdscope* will be full of information about our other volunteer efforts, Project PigeonWatch and Project Tanager.

Watch for it this winter—and let us know what you think.

Rick Bonney
Director, Education and Information Services

mals, Boris Veprintsev was an avid recordist. He made 30 recording expeditions between 1959 and 1988, traveling to the most remote corners of the former Soviet Union to capture the voices of birds, including some that are now extinct. Many of the recordings are outstanding, according to Greg Budney. Veprintsev created the Phonotheka at the Russian Academy of Sciences in Pushchino (near Moscow) in 1973.

Veprintsev also made a unique contribution to Russian culture: the best-selling wildlife records in the world. His "Voices of Birds in Nature," a five-record series, has sold more than 3 million copies.

One of them is now being enjoyed by Lab staff, a gift from Veprintseva at the November ceremony. The Russian visitors took home mementos of the event as well: from former LNS curator James Gulledge, a compact disc recording of Russian composer Dmitri Shostakovich's works, performed by American jazz pianist Keith Jarrett; and, from LNS, a portable compact disc player with which to listen to it.

Elephant News

Well-digging documented

by Katy Payne

Eight years ago the Lab of Ornithology invited a pair of strange birds—Bill Langbauer and me—into its nest. I say "strange" because the egg we were incubating showed signs of containing large, wrinkly, gray animals with trunks and no feathers. The circumstance that made the Elephant Project part of an ornithology lab is simple enough to describe: it was sheer generosity. The link between our research and the Lab's programs was not as obvious in those days as it is now, for the Bioacoustics Research Program had not yet been founded—and those were leaner days for the Lab. A tight or fearful administration would have suspected a cowbird and turned us away.

Instead, we were welcomed into a family of naturalists who seemed not to feel frightened by what the egg might contain, and have stood by amusedly watching us feed our ungainly, flightless chick. I thank the Lab for the generous spirit that has enabled us to survive, and I report here that our hatchling is still supplying its (by now many) foster parents with surprises.

In the winter 1992 issue of *Birdscope* Bill Langbauer wrote about our 1990 expedition to Zimbabwe, in southern Africa. There we monitored the calls and locations of separated elephant families in the Sengwa Research Area, using a marvelous new combination of radio telemetry and computer technology devised by Bill and collaborators Rowan Martin, Russ Charif, and Steve Powell.

My role in the expedition was to continuously observe the radio-collared elephants so that we could connect the sounds we were recording with elephant behaviors. This job was fun, but it was also frustrating, for elephants have an astonishing ability to hide. To avoid disturbing their natural behavior, we usually watched elephants from the high edges of the escarpments that overlooked the valley. In the end, almost none of the observation periods coincided with periods in which the elephants we were recording happened to be calling to one another. This was just a matter of chance—science is an obstinate partner with a mind of its own.

But the behaviors that we were watching led to another discovery. It started as a simple wondering: Why was it that day after day, groups of elephants stood stock still in the same particular outer bends of the dry riverbeds with their trunks in the sand? Eventually I couldn't bear not knowing, and this question became the motivation for a second expedition to Zimbabwe in the summer and early fall of 1992.

It turns out that when rivers dry up, elephants dig wells through deep sand to the water table underneath. By wells I don't mean open pits, I mean long, narrow tunnels through dry sand, carefully crafted so that water can be extracted for several days or even weeks before the wells cave in. Elephants spend large amounts of time at this enterprise even when other sources of water are available, and even though the wells are incredibly fragile, quickly emptied, and very slow to refill.

So I wondered, what is it that makes this behavior worthwhile? Is it the presence of unique minerals in the well water? Is it the opportunity for an elephant, for instance the mother of a young calf, to own a source of water that she can defend for her offspring? The data which will support or qualify these hunches have come back with me to the Lab and I am analyzing them now.

In the course of a four-month study we also wondered increasingly about the elephants' apparent knowledge of the depth at which water lies under the surface. How do they choose where to dig in the vast, white, sandy highways, sometimes half a

ZACCHEUS MAHLANGU

Why do elephants dig tunnels in dry river beds to reach water—even when other water sources are available?

kilometer wide, that were once rivers? It was uncanny that where water lay within a meter of the surface (trunk-deep for a big elephant) the sand was perforated with wells and trial digs, while areas where the water lay deeper were untouched.

We checked the depth of water in the untouched areas by digging ourselves. With the air temperature 100 degrees Fahrenheit and more we'd watch each other disappear—heads, shovels, and all—into dry pits in the white-hot sand. So how do the elephants assess the water table's depth without digging? We don't know, but here is an intriguing idea. Bernie Hutchins, a Cornell engineer, believes that their ability to hear infrasound (very low frequency sound) might enable them to measure the water's depth by listening to echoes of their footfalls above underground water. In the long run an investigation of well-digging may lead to a new association between the Elephant Project and the Bioacoustics Research Program.

KATY PAYNE

A mother and calf at a riverbed well.

This project is now incubating, and meanwhile another egg has been laid. Two Africans who participated in both of our Sengwa projects are, at my instigation and with my help, starting to write nature field guides in their own languages—Shona and Ndebele. The existing guides to Zimbabwean wildlife, written for and by foreigners in foreign languages, ignore local people both as informants and as the future guardians of their natural resources.

I hope that the interest their work generates will help to reverse that trend. If it does, the beneficiaries will be birds as well as their five-ton, flightless cousins.

AROUND THE LAB

Grants and Awards

The Lab was honored recently with an award from the U.S. Forest Service for work as a "special Forest Service partner" on behalf of wildlife resources. Lab general director **Scott Sutcliffe** accepted the award at the North American Wildlife and Natural Resources conference, held March 21 in Washington, D.C.

The Office of Naval Research (ONR) has appointed Bioacoustics Research Program director **Christopher Clark** chief scientist for the Navy's marine mammal monitoring program. Clark has been awarded a grant from ONR (totalling $308,000 for the first year) to analyze and interpret whale acoustic data collected by the Navy. Clark will also be evaluating the Navy's underwater surveillance systems to determine their scientific usefulness for marine mammal monitoring.

Lab, USFS Sign Memorandum

The Lab and the U.S. Forest Service (USFS) have signed a Memorandum of Understanding (MOU) to further collaborative efforts to stabilize populations of neotropical migratory birds. On February 1, Robert Nelson, director of Wildlife and Fisheries for the USFS, traveled to Ithaca to sign the MOU on behalf of USFS chief F. Dale Robertson. Nelson also toured the Library of Natural Sounds and presented a seminar on managing wildlife on national forest lands.

CYNTHIA BERGER

Lab director Charles Walcott and Robert Nelson, USFS, signing the MOU.

The MOU will establish a framework for the Lab and the USFS to jointly plan and carry out bird conservation projects. The two organizations have already collaborated on the slide/tape presentation, "Migrant Birds: A Troubled Future?," developed as part of the Partners in Flight program. USFS will also play a major role in developing and conducting the Lab's Project Tanager.

News From LNS

The Library of Natural Sounds (LNS) celebrated two landmarks recently: the number of bird species represented in the collection reached 5,000, and the total number of recordings in the collection reached 90,000. Among the acquistions that contributed to these totals was Lab associate Mark Robbins's tape of a giant ant-pitta, which is the first-ever recording of this species. Another notable recording was Lab associate Paul Coopmans's mustached ant pitta—a new species for the collection, and a recording that documents the first sighting of this species in Ecuador.

Farewell

Bill Langbauer started his new job as director of research at the Pittsburg Zoo on April 1. Bill had been a research associate at the Lab since 1984, when his and Katy Payne's study of the infrasonic calls of elephants became one of the Bioacoustics Research Program's first efforts. Bill was also a founder and the first captain of the Lab's intrepid softball team, the Blue-footed Boobies. We miss him in many ways but rejoice in his success; his answering machine at the zoo says, "Sorry if I'm not here—if I'm lucky, I'm out doing research!"

What Ground-Feeding Birds Like to Eat

Results of the FeederWatch Food Preference Study

by Diane L. Tessaglia

Each spring for the past five years, thousands of Project FeederWatch participants have sent the Lab 10 data forms apiece, telling us what kinds of birds, and how many, they saw at their backyard feeders. The forms add up to a mountain of information on bird population trends—we now have over 200,000 records in our computer.

FeederWatchers have been doing more than just counting birds, though. They've also taken part in a variety of special studies of backyard birds. This past year, FeederWatchers conducted a food preference study, asking "What foods are preferred by the birds that come to feeders?"

This question is interesting for several reasons. First, seed companies offer a bewildering variety of bird foods, and North Americans spend a substantial amount of money on bird feeding every year. If we knew what food each feeder species likes best, people could modify their bird-feeding gardens to attract specific types and numbers of birds.

Second, birds in different regions may prefer different foods. Those of us who feed birds in the Northeast have always assumed that birds just don't like milo, and we rarely offer it. But recently we have heard from FeederWatchers in the Southwest that birds there eat it readily.

Finally, incredible as it may sound, no one has ever done food preference studies on a large scale. Aelrod Geis of the U.S. Fish and Wildlife Service made a classic study of feeder bird seed preferences in the 1970s, and his work has been quoted extensively as *the* authoritative reference. The study was done primarily in the eastern United States, however, and involved limited numbers of foods and bird species.

So last winter, Lab scientists asked FeederWatchers to collect information on birds' preferences for 27 different types of food, plus sugar-water and plain water. When we analyzed these data, the results for ground-feeding birds were particularly interesting.

Different groups of ground-feeding birds showed distinct food preferences. For example, quail and pheasant preferred cracked corn; doves, blackbirds, starlings, and sparrows preferred mixed seed. Doves, blackbirds, and starlings made cracked corn their second choice, however, whereas sparrows chose millet over cracked corn.

Northern cardinals were the only ground-feeding species that preferred sunflower to other seeds. Their first choice was black-oil sunflower; their second choice, striped sunflower. This finding made us wonder: Do most ground feeders ignore sunflower seed because they don't like to perch on the hopper and tube feeders in which it's usually served? (Cardinals, on the other hand, are often seen perching on these feeders.) Or do most ground feeders ignore sunflower because it's too large for their small beaks? (Cardinals have the largest beak of the group of sparrows that we studied, so they may be better able to process sunflower seeds.)

KARL H. MASLOWSKI

Last winter, Project FeederWatch participants studied birds' food preferences. This northern cardinal has selected a striped sunflower seed.

Our study did show that for several species of ground-feeding sparrows, about 20 percent of the birds fed on black-oil sunflower seed. Although this is a low percentage, it's higher than we expected. If sunflower seed were offered on the ground, would the ground feeders prefer it?

About 100 FeederWatchers started to investigate this question last winter—they took part in a pilot study for one of our new National Science Experiments. (For more information on the National Science Experiments, see the Summer 1992 issue of *Birdscope.*) The pilot study tested three foods—red milo, white millet, and black-oil sunflower seeds. These foods were offered in standardized feeders, so the results of the test would not be confounded by birds' preferences for feeder types as opposed to the foods themselves.

We're analyzing the data from this investigation now, so watch for more information in future issues of *Birdscope.*

Contribute to Our Understanding of Bird Populations: Join Project FeederWatch

Ornithologists will use the data you collect to monitor changes in bird populations and to answer many other questions about overwintering North American birds.

It's easy . . . and it's fun. Once every two weeks, from November to April, you'll record the kinds and numbers of birds at your backyard feeder on easy-to-use forms. Sign up now, and this November we'll send you everything you need to get started. Just clip out the convenient coupon on the *Living Bird* wrapper, and mail it to us with your $14 registration fee.

FeederWatch is a joint effort of the Lab and Long Point Bird Observatory, Port Rowan, Ontario. For more information, call or write: Project FeederWatch, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. (607) 254-2414

Birdscope, ISSN 1041-6676, is published in December, March, and June by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone (607) 254-BIRD. *Birdscope* is free to members of the Lab, a nonprofit, membership organization for the study, appreciation, and conservation of birds. For information on membership please write to our Membership Department. Copyright 1993, Cornell Laboratory of Ornithology.

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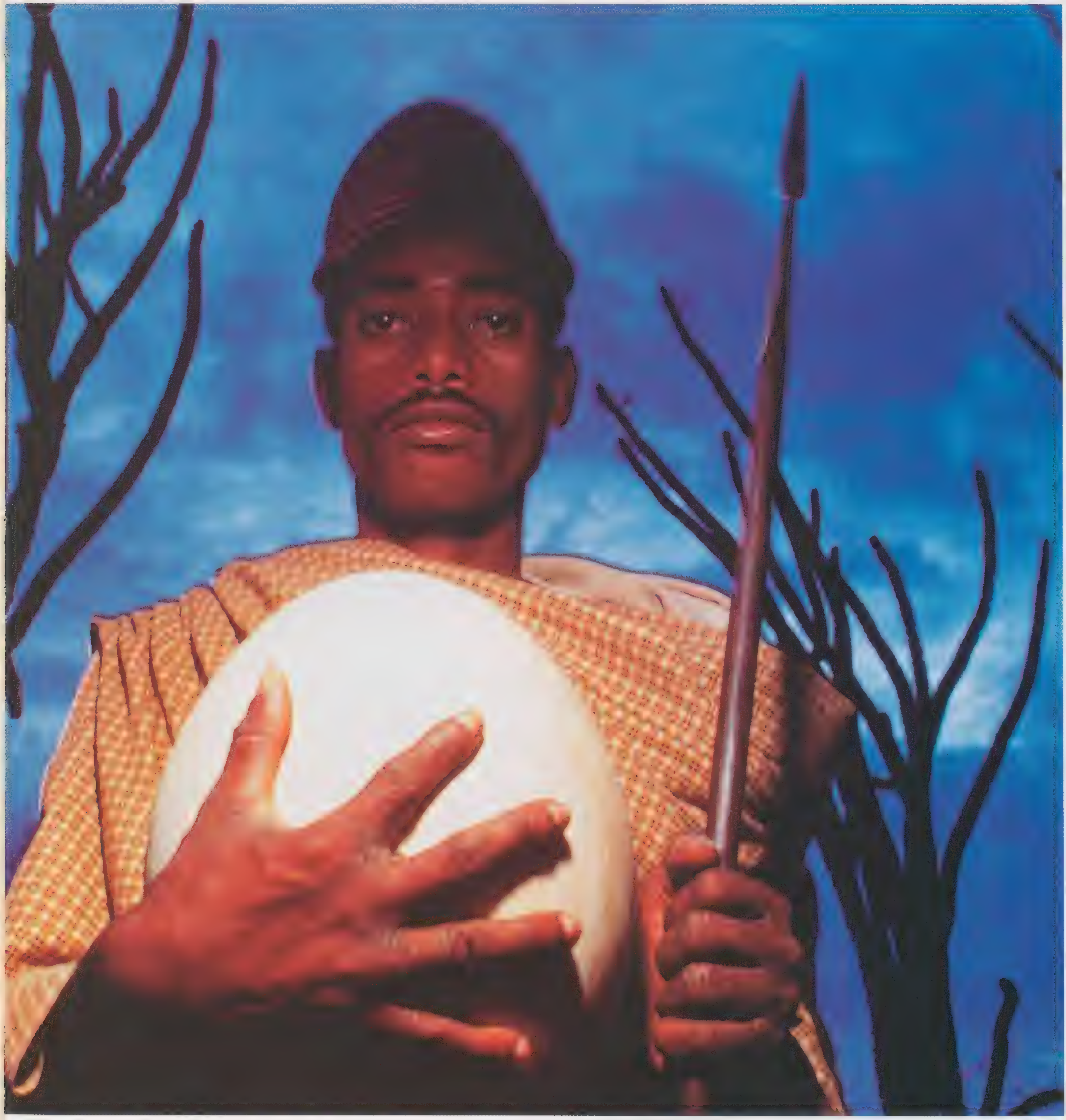
Land That Time Forgot



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Through his many trips to Madagascar, Frans Lanting has come to know and appreciate the indigenous people. At left, he visits some friends—Mikea tribesmen, who live in the harsh environment of the island's western dry forest. In the eerie light of a Madagascar evening, an Antandroy tribesman, above, cradles the egg of an elephant bird—one of the largest birds that ever lived. Though the birds have been extinct for several centuries, their intact eggs are still occasionally found buried in the sand.

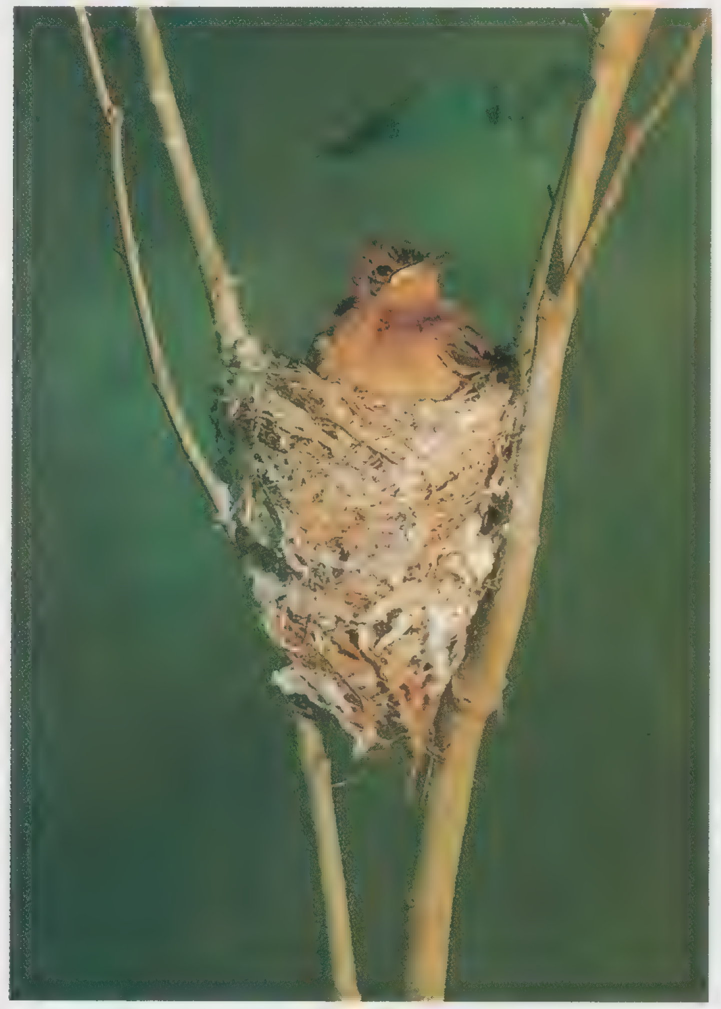
outer space, the island of Madagascar now appears to bleed into the ocean, as its red soil erodes away.

"The environmental destruction in Madagascar stems from the tremendous poverty of the local people and their need for arable land," says Lanting. "Slash-and-burn agriculture made sense as long as there was a low human population density and a lot of forest; now Madagascar's becoming really overpopulated."

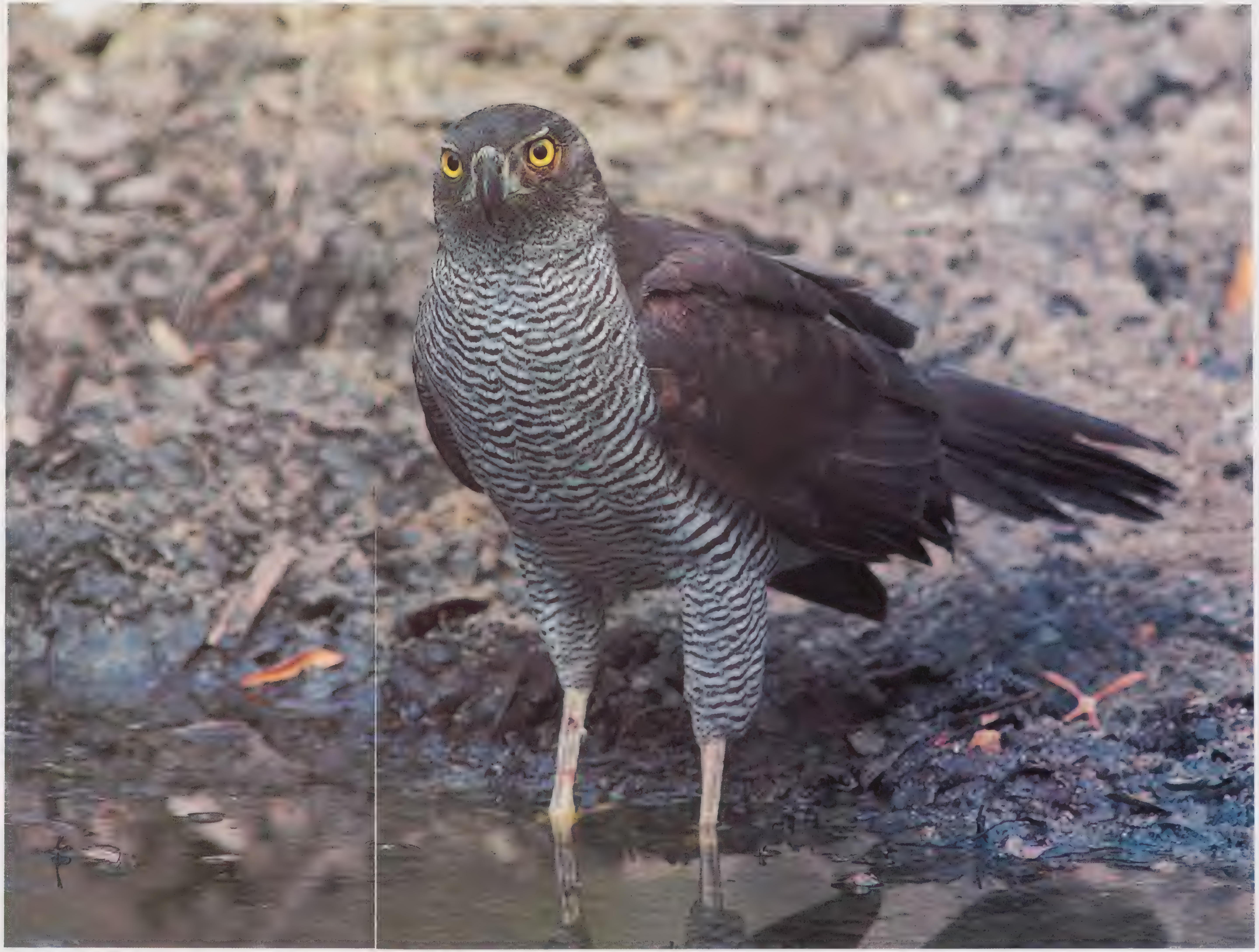
Lanting has great empathy for the Malagasy, the indigenous people of Madagascar. He refuses to condemn them for damaging their environment. "You can't expect to turn around traditions that have been applied for centuries in just a few years," he says. "When it comes to the use and abuse of forests, we've got only a tiny remnant of our old growth forests left in the United States and we still can't control our own logging. You have to look at it in context, and appreciate the problems as well as the solutions people are formulating in Madagascar."

In his book, *Madagascar: A World Out of Time* (New York: Aperture Foundation, Inc., 1990), Lanting evokes the magnificence of Madagascar—the beauty of its varied habitats, wildlife, *and* its indigenous people. With the book and other published photographs in magazines, he has helped to put a face on a country that, for most people, had been obscure. Others have subsequently come to Madagascar, including scientists, conservationists, ecotourists, and dozens of photojournalists. To Lanting, the renewed public interest in Madagascar is a positive development.

"I feel more hopeful about Madagascar than other parts of the Third World," he says. "When I first went there I was astonished to learn that the annual budget for their parks and reserves was less than $1,000. Now, thanks to the help of international conservation organizations and a change in Malagasy attitudes, the figure is in the millions. And ecotourism is now a factor contributing to a new kind of economy that may point toward a way to integrate our Western desire for unspoiled forest with the Malagasy's need for a sustainable future." — *Tim Gallagher*

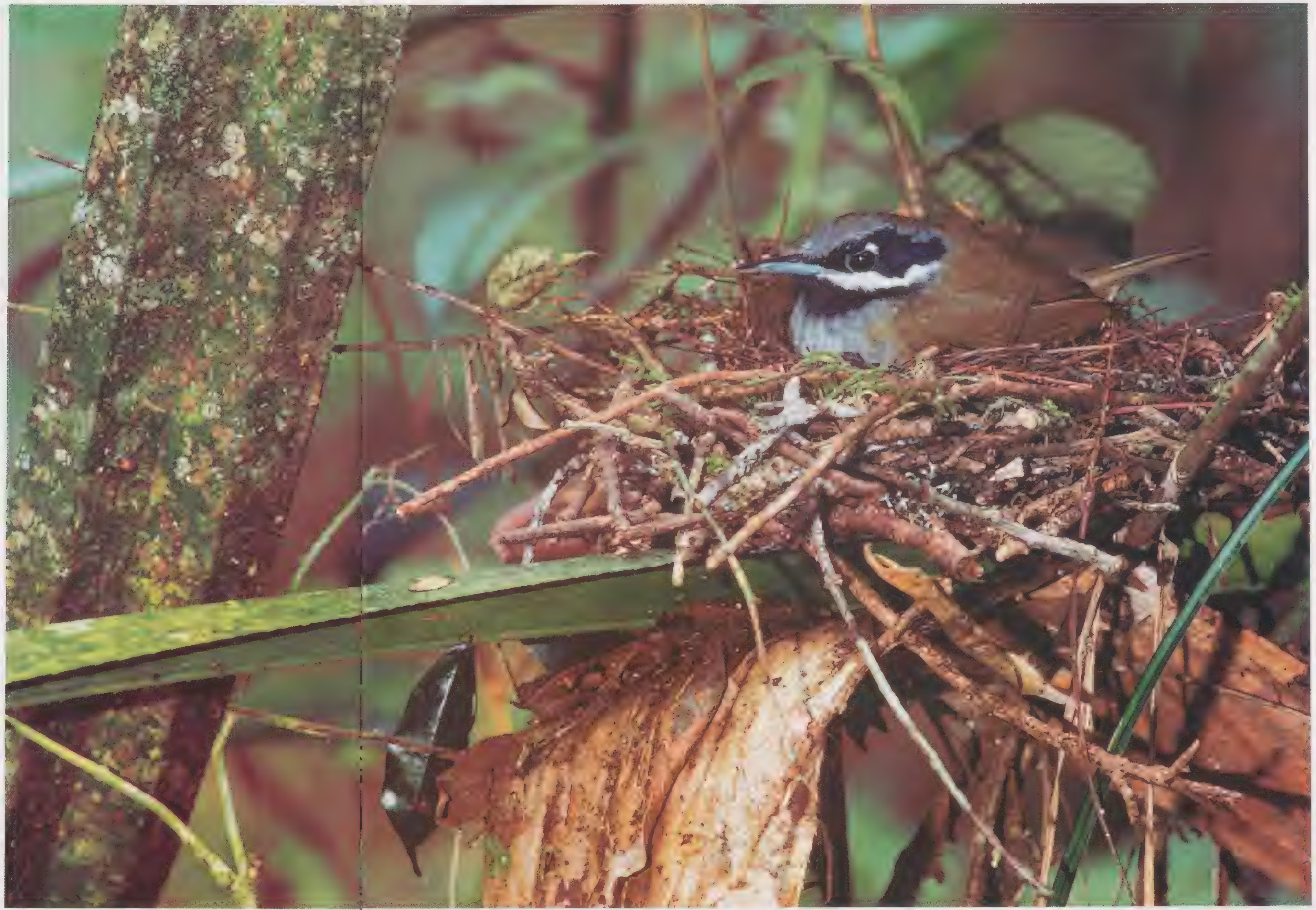


A widespread island resident, the Madagascar paradise flycatcher thrives in a variety of woodland habitats. At left, a nest and one young of this handsome species.

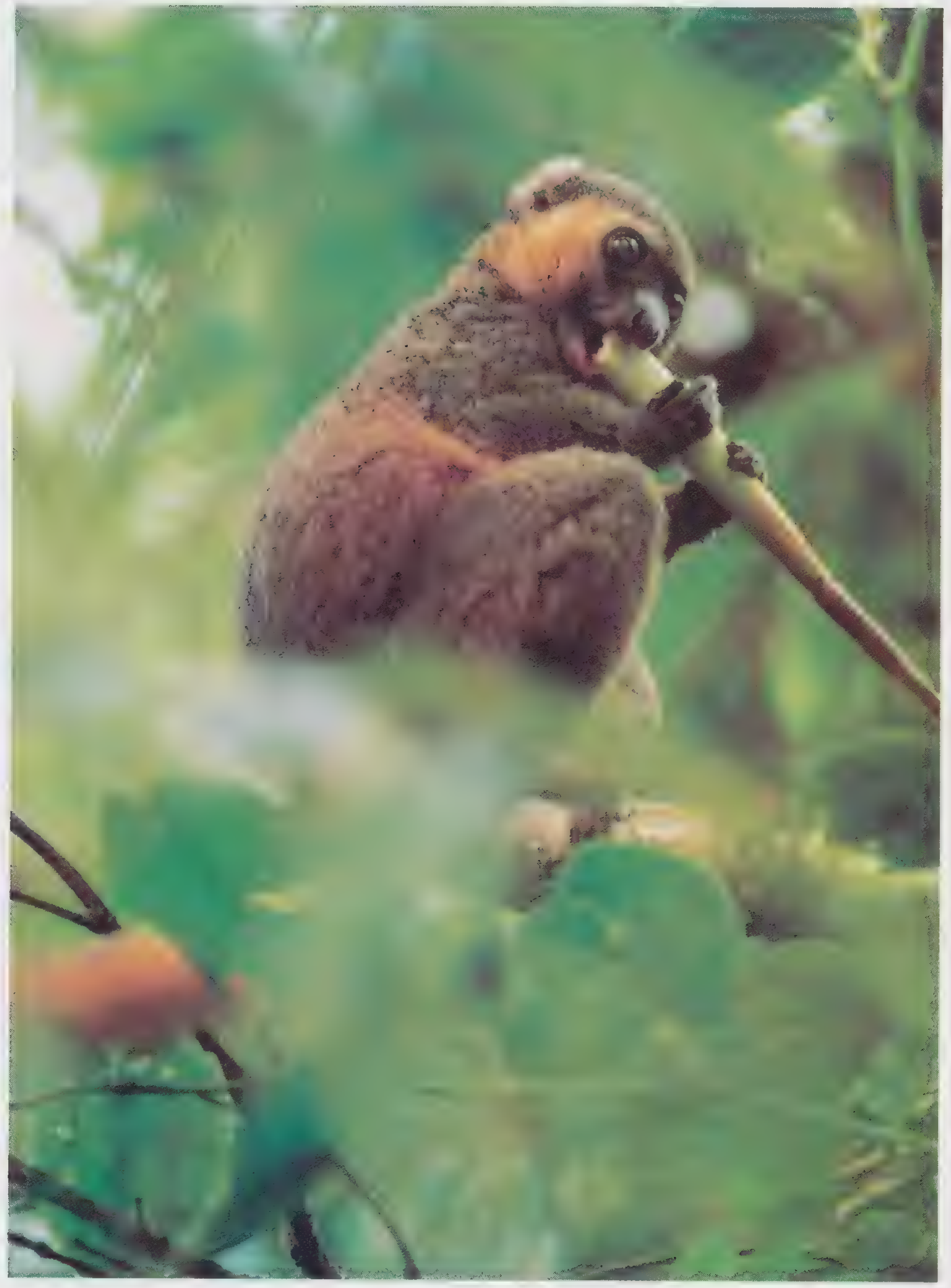


Lanting waited for hours at a waterhole in Madagascar, hoping to take pictures of wildlife coming to drink or bathe. One visitor he photographed was the rare endemic species above, a Henst's goshawk. During an 18-month ornithological survey of the island, researchers saw only two of these birds.

On the previous two pages: In a scene resembling a war zone, workers stand amid the rubble of a forest being cleared to make way for a major road-construction project. Beyond them lies a patchwork forest, scarred by slash-and-burn farming techniques.



Lanting was the first to photograph the Crossley's babbler, above, a shy songbird that lives in the eastern rainforest of Madagascar. While he photographed this bird, Lanting could hear the ominous sound of axes felling trees.



Before its existence became public knowledge, Lanting photographed this then-anonymous primate, left, which was later named the golden bamboo lemur. With only a few dozen surviving, this lemur is one of the world's most endangered primates.

EVERGLADES

Text and photographs by Tim Gallagher

I am always astounded when I visit the Everglades. Even viewed from high above as I'm en route to Miami, the area is impressive, stretching nearly as far as the eye can see in every direction. But at ground level the Everglades is a birder's dream: a place of unparalleled natural beauty, full of wildlife—wood storks, roseate spoonbills, countless herons and egrets, alligators, and more. Hard to imagine that this great wetland is in danger, or that the huge flocks of wading birds that now inhabit the Everglades represent but a fraction of the numbers that once darkened the skies here.

In the mid-19th century the Everglades lay virtually undisturbed—an immense wilderness of saw grass covered by a thin, slow-moving sheet of water almost 50 miles wide. But even at that early date people were already forming plans to turn this "worthless" swamp into productive farmland. Large portions of the original Everglades have since been cut by canals and ditches, blocked by levees, and drained till they're as high and dry as a Kansas prairie. And now the entire Everglades watershed, including the 1.4 million acres designated as a national park in 1947, is threatened with ecological ruin.

Ditched, drained, and polluted, can the Everglades be saved?

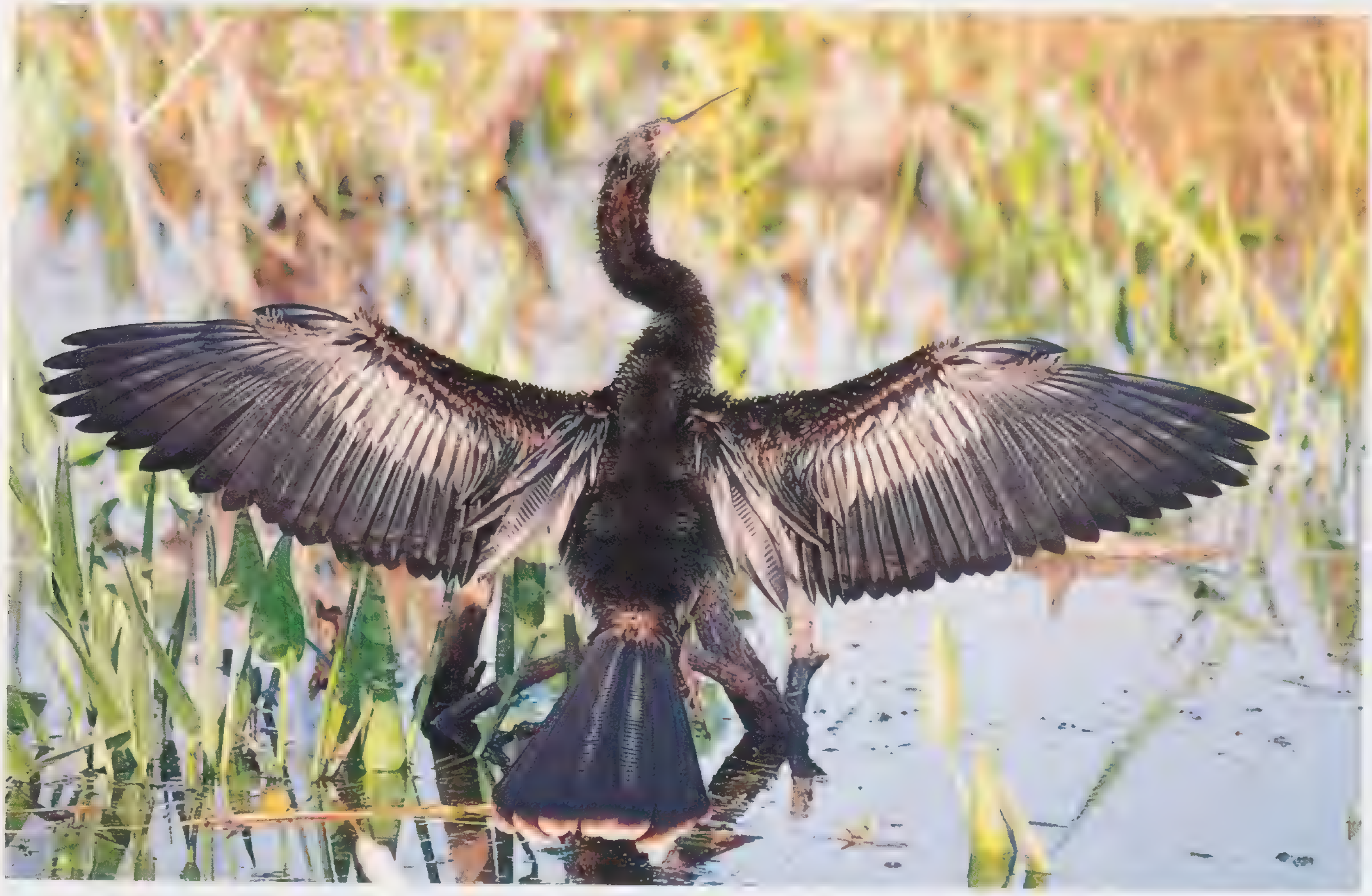
What caused this impending disaster? And what can be done to rescue this irreplaceable national treasure? One thing is certain: all of the problems facing the Everglades can be reduced to a single factor—water. If the quality, supply, distribution, and timing of the water can be returned to something resembling the natural flow, then there is yet hope for the remaining Everglades.

Restoring the natural water conditions will not be easy. The entire northern section of the Everglades has been unalterably changed, and this affects the entire watershed. Originally, water from Lake Okeechobee would spill over its southern banks or seep through the porous peat soil and flow in a broad, shallow swath all the way to Florida Bay, 100 miles south. But the U.S. Army Corps of Engineers built a dike along the southern edge of the lake, then constructed an elaborate system of levees, canals, and impoundments to control the flow of water. They drained a 700,000-acre portion of the northern Everglades below Lake Okeechobee to form the Everglades Agricultural Area (EAA),

An immature white ibis, above, perches on an old dugout canoe at the Everglades National Park. Though perhaps best known for its wading birds, the Everglades holds a wealth of wildlife, ranging from tiny tree snails to deer and panthers.

where most of Florida's sugarcane now grows.

For several years the EAA has been the center of a bitter controversy over water quality in the Everglades. Runoff containing nitrogen and phosphorous is draining from cropland and entering the Everglades ecosystem, causing radical changes in the plant community. Although high concentrations of these nutrients would not harm some ecosystems, the Everglades is an oligotrophic system—naturally deficient in plant nutrients. The Everglades plant community has evolved for the most part living only on the nitrogen and phosphorous found in rainwater. According to Paul Parks, director of "Foreverglades," a program of the Florida Wildlife Federation, the natural phosphorous level in the area was around 7 to 10 parts per billion, whereas the runoff water now averages about 200 parts per billion.



Looking decidedly reptilian, an anhinga dries its wings in the sun, above. Anhingas are common residents of the Everglades, where visitors often see them swimming underwater after prey or emerging with fish impaled on their bills.

"The natural Everglades has a lot of biomass, but it doesn't grow very fast," says Parks. "When you pump this high-phosphorous, high-nitrogen water into that kind of system, the plant community changes radically."

Cattails are the main beneficiary of the nutrient-rich runoff. They are spreading rapidly, choking out the natural aquatic habitats. In the past, cattails grew in the Everglades only in small alligator holes, where bird and animal droppings had released nutrients, or in areas where fire had burned the peat soil. In Loxahatchee National Wildlife Refuge more than 6,000 acres are now clogged with cattails. Paul Parks estimates that between 30,000 and 50,000 acres have been affected by the farm runoff to date. He warns that if nothing is done, the entire Everglades system could eventually go under.

"When you dump this much phosphorous, and the cattails ultimately dominate, every one of the Everglades habitats except tree islands is affected," says Parks. "Saw grass is replaced; wet prairie is replaced. The cattails will even grow on floating mats in the deep water of sloughs."

In the warm, year-round sunshine of Florida the cattails are remarkably prolific. They grow up to 12 feet tall, packed together tightly. Such an enormous pile of organic material falls into the water that the re-aeration process can't keep up with it. An organic goo forms in which small fish can't survive.

"What you have where the cattails grow is just biological trash," says Parks. "There's nothing for birds to eat in it. And they wouldn't waste their energy wading through those dense cattails even if there were something to eat. The open areas the wading birds depend on are getting covered up by cattails."

But fighting for the water quality of the Everglades has meant taking on the powerful sugar industry. One of the cruelest ironies is that sugar farming in the Everglades area would probably not be economically feasible if not for government price supports and restrictive tariffs levied against foreign sugar producers. Even in this age of free trade, the sugar industry has been powerful enough politically to keep trade restrictions affecting sugar imports largely intact. The American consumer, who must pay up to three times the world average for sugar products, is one of the primary losers in the affair. Other losers are the developing nations whose economies depend on sugar exports.

Until October 1988, the sugar industry had fought environmentalists to a standstill on the Everglades water quality issue, managing to maintain the status quo in spite of overwhelming scientific evidence of the harm being caused by their farming practices. Then a remarkable event took place: The U.S. Attorney for south Florida, Dexter W. Lehtinen, filed a federal lawsuit against the Florida Department of Environmental Regulation and the South Florida Water Management District, accusing the two agencies of breaking state and federal law by allowing polluted agricultural runoff to flow into Everglades National Park.

A Storm Called Andrew

In the early predawn hours of August 24, 1992, a powerful hurricane slammed into south Florida, leaving in its wake a path of destruction that resembled a war zone. The storm, dubbed Hurricane Andrew, had winds in excess of 164 miles per hour and left tens of thousands of people homeless. But though the storm was a great tragedy for humans, most wildlife populations in the Everglades seem to have escaped harm.

"Up to this point, the strong impression is that Andrew did not have a significant impact on animal populations," says park biologist John Ogden. "Most wading birds were out of south Florida during August, and certainly all the animals that were radio-collared—panthers, bears, deer—seem to have come through it well."

The timing of Hurricane Andrew and the path it took helped to lessen the storm's impact on wildlife. Andrew crossed the interior freshwater portion of the Everglades in late summer, a time when the area is usually flooded from summer rains and animals have left the region. "There's a strong seasonal pattern," says Ogden. "In the freshwater areas, the wading birds tend to leave during the wet season."

In his early tours of the park after Hurricane Andrew passed, Ogden did not find large numbers of dead herons and sea turtles as people had after hurricanes Donna and Betsy in the 1960s. The difference is that those earlier hurricanes hit along the coast, which has larger resident populations of birds and other wildlife. Though the mangroves along both coasts were severely damaged in a 15-mile-wide swath where Andrew entered and exited the mainland, the marshes in between came through virtually unscathed. And within weeks of the storm, defoliated deciduous trees were already budding out and unfolding new leaves.

The National Park Service recently began a special hurricane impact study to examine the long-term effects of the storm on the wildlife and ecosystems of three south Florida parks (Everglades, Biscayne, and Big Cypress). Park biologists also plan to take intensive censuses of endangered species.

Ogden's long association with the Everglades—he first worked there as a biologist in 1965—provides a unique perspective on Hurricane Andrew. Three weeks after the storm struck, Ogden and Bill Robertson, another biologist, were flying above the park, trying to assess the damage to vegetation.

"As we were circling, we looked down simultaneously and noticed an absolutely beautiful mangrove forest that was completely untouched by Andrew," says Ogden. "It suddenly dawned on us that this forest had been completely flattened by a combination of Hurricane Donna in 1960 and Hurricane Betsy in 1965, and now there was no sign that it was ever damaged. It really drove home the point that a place might look messy now, but five years, ten years, fifteen years from now, it'll be back."

— *Tim Gallagher*

GARY BRAASCH

Hurricane Andrew damaged vegetation in a 15-mile-wide swath as it cut through Florida. Above, slash pines felled by the storm. Though Andrew was a major disaster for humans, it probably did not have a significant impact on wildlife populations.

The state agencies dragged their feet for more than two years, in the process wasting six million dollars of taxpayer money in litigation. Then another fortuitous event occurred: Lawton Chiles was elected governor of Florida. He and his staff have been much more willing than the previous administration to work with environmentalists to solve the water quality problem.

In February 1991 the Federal District Court agreed to delay the lawsuit, pending an out-of-court agreement being reached by both parties. In exchange for the delay, Florida pledged to help federal scientists prepare an Everglades cleanup plan. Since then the Everglades SWIM (Surface Water Improvement and Management) Plan—which calls for 35,000 acres of farmland at the southern end of the EAA to be converted into a flow-through marsh that will filter phosphorous

from the water—has been approved by south Florida water managers.

Unfortunately, sugar growers have continued to stall. Though many farmers agree in principle that the phosphorous flowing into the Everglades should be reduced, they don't want to pay for removing any phosphorous that they did not add directly to their fields as fertilizer. They fail to address the fact that their agricultural practices are to blame for releasing nutrients from the peat soil. The farmers drain their fields, which exposes the peat soil to oxygen and allows a microbial process to begin that releases large quantities of nitrogen and phosphorous. Since the soil is very porous, rainwater percolates down, picking up the nutrients as it goes, and then moves into a system of drainage ditches and arterial canals that flow directly into the Everglades.

But Paul Parks believes that the cleanup can be accomplished, even without the full cooperation of the sugar industry. "The tide has turned," says Parks. "We were getting stonewalled for a long time. But now we have a settlement agreement filed with the federal court. The agreement puts the state and federal agencies on the same side with environmentalists. If the agreement is broken, the case goes directly back to federal court."

If the Everglades SWIM Plan is finally implemented, a great deal of potential damage to the Everglades National Park should be averted. However, the most immediate problem facing the park itself is not so much one of water quality at this point as it is of water supply and distribution. According to park biologist John Ogden, who coordinates major restoration projects for the park, few vegetation changes have taken place yet in the southern Everglades.

"What has really had a massive impact on the wildlife in the park during the last forty years has been the changes in the volume, timing, and distribution of the water," says Ogden.

In the 1950s and 1960s when most of the levee system in the central Everglades had been completed, explains Ogden, the area went through a devastating dry period. To make matters worse, an adequate water delivery system for the park had not yet been worked out. The southern Everglades experienced five or six years of serious overdrainage.

The U.S. Army Corps of Engineers attempted to solve the problem by building a canal and levee along the eastern boundary of the national park, hoping to force all the water into the park rather than allowing it to spread out over the full Everglades area. The same amount of water that had flowed across in a 50-mile-wide band was compressed into a much smaller area, and also shifted considerably west from where it had previously flowed.

According to Ogden, this and the earlier water projects had a devastating effect on wildlife, especially the large flocks of wading birds for which the Everglades was famous. The total numbers of nesting wading birds in the Everglades declined from an average of about 100,000 birds a year in the 1930s and 1940s to about 5,000 a year now. Wood storks, a closely monitored species at the park, declined from between 8,000 to 10,000 nesting birds a year to about 500 during the same period.

"The projects changed the water distribution and drying patterns throughout the southern Everglades basin," Ogden says. "Traditional wading bird rookeries were no longer next to water. Places that used to have deep water were now dry. Other places that used to be dry were covered with water. It completely changed the timing of drying."

Ogden believes that if the natural distribution patterns, flow patterns, and timing of the water can be reestablished, then many wildlife populations at the park should recover. Some major obstacles to restoring a natural water flow to the park have recently been overcome. Congress has authorized the purchase of 107,600 acres of land along the eastern side of the national park. The U.S. Army Corps of Engineers plans to remove the canal and levee from the park boundary, thus allowing a natural sheet flow of water into the area. The project will restore more than 75,000 acres of wetland, which includes 25 percent of the wood stork's original feeding grounds.

Though it will take several years for the Corps to complete the project, Ogden is hopeful about the future of the Everglades. "I've been around here long enough to have seen it when it had a lot more wildlife than it does now," he says. "I know the excitement of the place when it had the big rookeries. We have a real potential for bringing it back, at least to the way it was in the 1950s. There seems to be a real commitment now, and an understanding of what needs to be done. We didn't have either ten years ago."

Can the Everglades be saved? It may be too early to say, but conditions have never been better politically than they are now. President Clinton has pledged that his administration will be attentive to conservation issues. The newly appointed heads of the Environmental Protection Agency and the Justice Department both come from Florida and are familiar with the ecological problems of the Everglades. But perhaps the most promising sign of all came this February in a speech delivered by new Interior Secretary Bruce Babbitt at the Everglades Coalition Conference in Tallahassee. Babbitt offered his full support for the preservation of the Everglades and said that he would form a federal Everglades Task Force to shepherd the controversial cleanup plan to completion. "The Everglades is a test case for all ecosystems in the entire country," said Babbitt. "This is the one that needs attention now." ■

Everglades National Park is a dream come true for birders and photographers—a place where wading birds are often easy to approach. This green-backed heron, far left above, sat calmly beside a boardwalk. Evening falls over a pond in the Everglades, above, beginning the nightly cacophony of rail calls, alligator bellows, and other bizarre sounds.

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Profile

SPOTLIGHT ON DAVID WILCOVE

by Cynthia Berger

Meet Living Bird's defender of the underappreciated

A framed cartoon hangs above the desk in David Wilcove's Washington, D.C., office. It shows a defiant-looking spotted owl scolding two hatchet-toting men, George Bush and an Oregon politician. "Read *my* lips," the owl says. "No new axes." Meanwhile, the window in Wilcove's office frames the Capitol building, where the owl's fate—and that of the old-growth forests it inhabits—will be resolved. The cartoon and the Capitol make a potent juxtaposition, and in a way, they encapsulate the life and goals of the ecologist-activist who contemplates them.

Living Bird readers know Wilcove from his column, "Spotlight," in which he writes about endangered species—not media darlings such as the California condor, but obscure and usually overlooked birds that nonetheless deserve attention. What readers may not know is that for the last eight years, as a staff biologist with three major environmental organizations, David Wilcove has also played a key role in some front-page conservation issues, including the battle to protect the northern spotted owl.

SCOTT ROBINSON

Contributing editor David Wilcove works hard on behalf of birds—and plans his vacations around finding rare ones.

Tropical ecology is one of Wilcove's special interests, so we asked him what life path led him to the political jungle of Washington, D.C., instead of a rainforest trail.

Wilcove relates, "I started bird watching when I was three. No one in the family was interested in birds except me (probably a genetic abnormality), but my long-suffering parents would take me to meetings of the Buffalo [New York] Ornithological Society.

"I went to Yale University, intending to major in history and become a lawyer. But I found myself hanging around the biology department—they had a wonderful ornithological library and collection. So I decided, well, I ought to major in biology."

Then his interest in birds crystallized into a commitment to their conservation. Says Wilcove, "The year I finished my undergraduate degree was the height of the 'Sagebrush Rebellion.' Jim Watt was interior secretary, Ann Gorsuch was head of the Environmental Protection Agency, and I was *mad.* I saw all these important resources being squandered by the Reagan administration, and I wanted to do something about it."

When he began his graduate studies at Princeton University, Wilcove insisted on a thesis topic that would have practical conservation applications. At the time, Ph.D. candidates were expected to do "basic" research—devise a new theory or test an existing one. Wilcove's thesis advisor, ornithologist John Terborgh, remembers, "David was breaking some ice at Princeton, which prides itself on having a theoretical approach to every discipline, including the biological sciences. He was one of the first to take a different tack." (Now, says Terborgh, Wilcove's approach has taken root in the program, and several students have followed in his footsteps.)

The early 1980s were also a time when ornithologists began calling attention to the startling population declines of some forest songbirds in the eastern United States. "Pioneer visionaries like U.S. Fish and Wildlife Service biologist Chan Robbins and U.S. Department of Agriculture biologist Bob Whitcomb were studying the problem," says Wilcove. "People noticed that some species—for example, worm-eating warblers and black-and-white warblers—occurred in larger forest tracts, but not small woodlots. The phenomenon was well documented, and people were coming up with a host of reasons for why forest fragmentation might cause population declines, but little actual research had been done. So I decided to investigate."

Wilcove stocked "dummy" nests with quail eggs and set them out in forests ranging from a vast tract in the Smoky Mountains to small woodlots on the outskirts of Washington, D.C., and Baltimore. "As forests were fragmented," he says, "I found an increase in the rate of nest predation—by raccoons, cats, and so on. Small forest fragments in suburban areas had tremendously high predation rates." His findings, published in the respected journal *Ecology* in 1985, attracted attention in the ornithological community and sparked a host of related studies.

"Dave's thesis was what you could safely call one of the most important studies of forest fragmentation," says Scott Robinson, ornithologist with the Illinois Natural History Survey and himself an expert on forest fragmentation and songbird declines. "It was a model of timeliness, an experimental verification of what people had been suspecting for a long time."

Ph.D. in hand, Wilcove headed for the conservationists' mecca—Washington, D.C.—and his first job, with The Nature Conservancy's Natural Heritage program. Soon, however, contacts with the Wilderness Society led to a position there. The job involved both scientific research and policy analysis—helping to craft the Society's positions on conservation issues. Wilcove's colleagues promptly nicknamed him "Dr. Science," after the know-it-all radio character.

"Then one day in 1986, someone dropped a hefty, two-volume government document on my desk" says Wilcove. "It was a draft of the Forest Service management plan for the northern spotted owl."

At the time, protecting the owl's habitat from logging was a hot issue in the Pacific Northwest, but it had no national resonance. In 1987 Wilcove and some colleagues traveled from San Francisco to Seattle, visiting national forests along the way. "It was an eye-opening event," remembers Wilcove. "I was horrified. The forests were being liquidated, absolutely destroyed. I couldn't believe this was happening on federal land, land that belonged to the American people."

Despite the loss of irreplaceable old-growth forest habitat, the U.S. Fish and Wildlife Service (USFWS) declined to list the bird as endangered, and this decision helped to thrust the reclusive owl into the national spotlight. Ordered by the courts to reconsider, the USFWS finally agreed to list the owl as threatened in April 1989. Meanwhile, federal land management agencies set up a committee (often called the Jack Ward Thomas Committee, for the Forest Service biologist who headed it) to evaluate owl management plans and come up with a scientifically credible strategy.

Wilcove was tapped to be the environmental community's representative to that landmark committee. "It was a six-month project," he says casually. "We produced this big report." That report was merely the most ambitious conservation plan for a single species ever developed. It definitively rebuffed the timber industry's assertions that the owl was doing fine, and it recommended putting 7.7 million acres of forested land off limits to logging—the largest acreage on which the nation had ever proposed to limit resource extraction on behalf of an endangered species.

This story doesn't quite have a happy ending—yet. The Thomas committee's recommendations were just the starting point for two subsequent owl management plans—and three years later, in his present position as senior ecologist for the Environmental Defense Fund (EDF), Wilcove continues to work to protect spotted owl habitat. "I'm optimistic that we may see legislation this year," he says, "but I've been optimistic in other years and been disappointed . . . so don't bank on my prediction."

GREG VAUGHN

Wilcove helped draft a landmark conservation plan for the northern spotted owl.

Meanwhile Wilcove is pleased that his position at EDF (a national nonprofit organization that links science, economics, and the law to solve environmental problems) gives him leeway to choose the issues he wants to champion. "In a typical day, I might meet with members of the Endangered Species Coalition, get a briefing from the Bureau of Land Management, file comments on the Forest Service's latest spotted owl management plan, or prepare an affidavit for a lawsuit over the Forest Service's timber practices in the southern Appalachians," says Wilcove. "Right now, we're spending a fair amount of time planning our strategies for moving the environmental issues we think are important through the new Congress and Administration." In addition to his EDF activities, Wilcove chairs the U.S. Section of the International Council for Bird Preservation and serves on the editorial board of *Conservation Biology.*

With such a busy schedule, we asked, does Wilcove still have time to go birding? "I plan my vacations around finding birds or visiting an area rich in endemic species," he confesses, "When I'm asked to give a speech, and they ask if I charge an honorarium, I say, no, but here's a list of birds that you've got to show me." The price of a recent address in Colorado included a flammulated owl and a white-tailed ptarmigan.

And what does the future hold? "I hope I'm always speaking up on behalf of rare, declining, and underappreciated critters," Wilcove muses. "I would like to do more writing, and I think there's also part of me that would like to spend more time in the field, particularly in the tropics. In this line of work, you don't spend as much time enjoying the things you're trying to protect as you do trying to protect them."

His commitment to conservation sparked by the Sagebrush Rebellion, Wilcove looks ahead to the full flower of a national revolution. "I'd like to think that five years down the line it would be unthinkable to log ancient forests or weaken the Endangered Species Act. It's exciting—I think there is a change in people's attitudes toward the environment. I hope it's a permanent change." ■

Critics' Corner

HUMMER TIME

Veteran hummingbird host Sally Spofford evaluates three popular feeders

At our home in southeastern Arizona, at least 14 species of hummingbirds have been sighted at our feeders. We have experimented with several different types of feeders and have naturally developed some purely subjective preferences. I must emphasize, however, that different situations may call for different features. Sometimes the disadvantages of one feeder may be outweighed by its advantages.

In general, sugar-water feeders for hummingbirds fall into two main types, gravity and nongravity. I will review here one gravity-type feeder, the Four-Fountains, and two nongravity-type feeders, the Hummzinger and the Humdinger.

The Four-Fountains consists of a heavy glass bottle with a narrow neck that screws, upside down, into a bright red cup. The four feeding holes are surrounded by red plastic flowers, into which are inserted yellow "bee guards." Below the flowers are red plastic perches, small-sized for hummingbird feet. A red plastic wire is included for fastening the feeder to a branch or hook. The feeder holds 8 ounces of fluid.

I have used this feeder and find it is attractive to birds, but it has a few disadvantages for the person who keeps it filled. One is that, being glass, it can break if it falls on a hard surface. The little perches on mine have broken too. Breakability is a problem for me because at night, my feeders are visited by raccoons and ring-tailed cats, which seem able to overcome all the obstacles we put in their way. It is simply not practical to bring the 20-plus feeders in my yard inside at night.

The bee guards have not proven to be very helpful in my case; bees just cluster on the guard. Maybe Arizona bees have longer tongues than most! Another problem is that if the bottle is not screwed securely into the bottom cup, it may fall. But the main drawback, as in all gravity-type feeders, is that you must make sure the feeder is completely empty before refilling it, or you will have sugar-water flowing down your arm and possibly onto your clothing as you invert the feeder and take it apart for refilling. It is not always possible or practical for us to wait until a feeder is empty before refilling it—for example, if a feeder is half-empty and we are going away for a few hours, we want to leave it full.

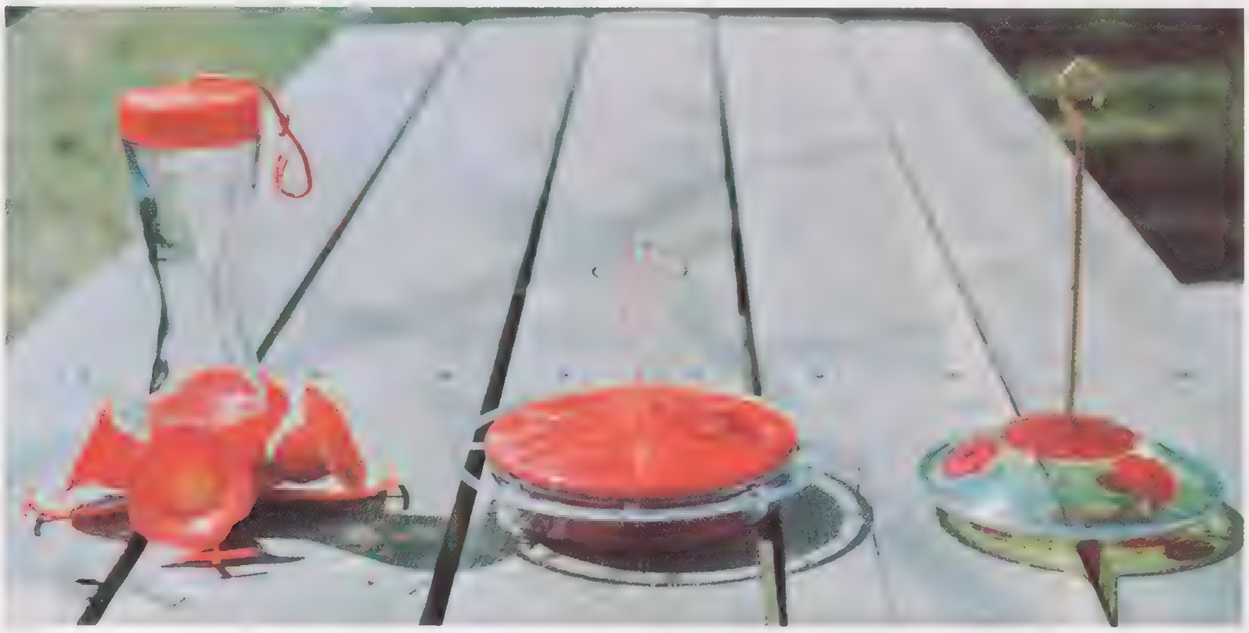
The Four-Fountains is not easy to clean: it is difficult to insert a brush into the narrow neck. A small test-tube brush will go in, but it doesn't do a good job of scrubbing. The best way to remove dirt or mold is to add some bleach or vinegar to hot water in the feeder and let it stand awhile.

I do like the looks of this feeder, and in some situations it could be ideal: if it is hung where it can be easily checked for refilling, easily removed if in danger of falling, and if bees are not too much of a problem. It retails for $12.95.

The nongravity feeders don't spill sugar-water down your arms when you open them, the way gravity feeders do, and they have the additional advantage of not spilling in strong winds. The Hummzinger consists of a flat plastic bowl about 8 inches in diameter and one inch high, and holds 12 ounces. The red plastic lid has four feeding holes, and the bowl is surrounded by a plastic perching rim. This feeder can be hung from a hook (which is included) or mounted on a pole. An ant guard is provided on the plastic stem above the feeder.

The manufacturer claims that this feeder is dishwasher-safe. I couldn't verify this; I don't own a dishwasher. The Hummzinger is easy to clean by hand, since the lid slides up the stem and off.

My chief objection to this feeder is that, unlike some other saucer-shaped feeders, it must be taken down for refilling; at least, my small hand cannot twist off the cover while it is hanging, even if I support it with the other hand. So I must put down my pitcher of sugar-water somewhere, remove the feeder from its hook, struggle to twist open the cover, and hold it up while pouring in the fresh sugar-water. If it were easy for me to slide and raise the cover while holding the pitcher in the other hand, this would be my first choice of all feeders, because of its ease of cleaning, visibility of the liquid level, and sturdiness. It costs $15.95.


TIM GALLAGHER

From left to right above: the Four Fountains, the Hummzinger, and the Humdinger. No guarantees on attracting a berylline hummingbird, though.

Perhaps I should mention that part of my own reluctance to take down any feeder for filling is that we have many birders watching our feeders, and naturally the birds are disturbed each time I go out, so I like to limit the time it takes me to do these chores.

My own favorite for hummingbirds is a flat "flying saucer" from Droll Yankee called the Humdinger, which, though somewhat difficult to clean thoroughly, is very easy to fill quickly while it hangs. A combination of this feature with the easy-to-clean Hummzinger bowl would be ideal. In May 1992, we attracted a rare berylline hummingbird to our yard, and it used the Humdinger feeder almost exclusively, coming to the same feeding hole every half-hour or so. The Humdinger holds 9 ounces and costs $12.50.

Hummers aren't the only birds that like sugar-water. I use open cups to offer sugar-water to orioles, finches, woodpeckers, and other larger birds, because the holes in the hummingbird feeders may be too small for these species.

—*Sally Hoyt Spofford*

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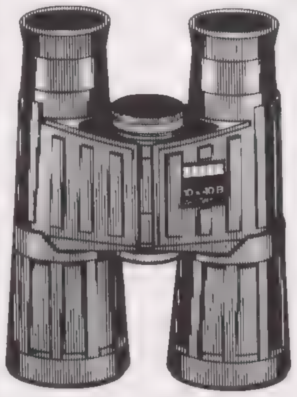

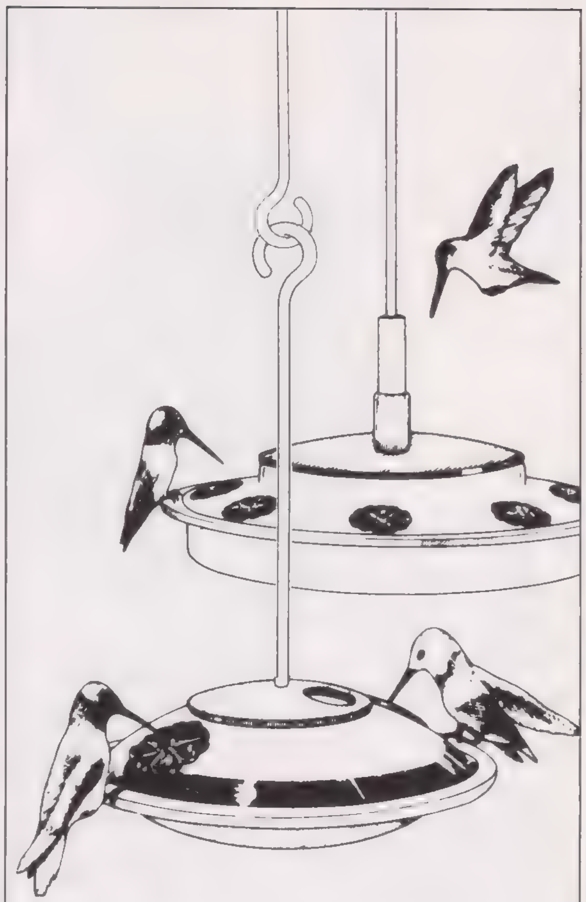

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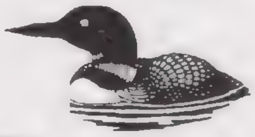

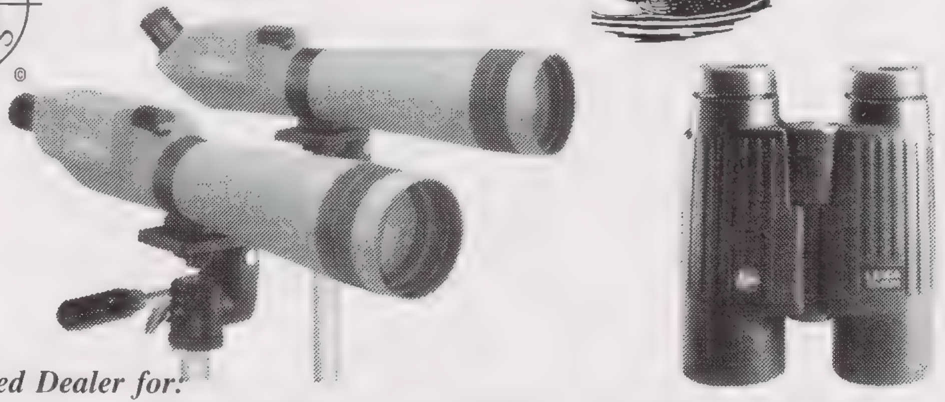

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DEATH LIST

by Pete Dunne

This isn't the kind of topic that you would have heard discussed at anybody's cocktail party—unless Stephen King is a birder. Its vast but macabre potential has never been bandied about at any bird club meeting or Christmas Bird Count roundup I've ever attended. And the notion of a birding death list probably wouldn't have surfaced at all, except we were already *that* close to death, 100 miles off the coast of New Jersey, clinging to ice-encrusted rails in heavy seas, praying for a vision of a great skua or the mercy of a bullet in the temple (and not necessarily in that order).

"I think I'm going to be sick," said Jim.

"I think I'm going to be sick and die," said Vince.

"I think I'm going to be sick and die before I can put skua on my life list," said Clay, pushing the needle on the loss register all the way to the right.

"I think that if you're dead," said Vince (who even dying is a most philosophical fellow), "you won't be able to put it on your life list, Clay."

"Then I'll put it on my . . . ulp . . . *death list*," said Clay. "You guys can just toss me overboard and the bird can have my remains."

"Hey," I said, intrigued by Clay's heroic offer. "Maybe you've got something there."

I don't know about you, but I've always been ambivalent about the prospects of burial and cremation. Small, dark places give me the willies, but I also don't like to think that the essence of my being could fit in a vase and lie dormant on the top shelf of a closet.

But now, thanks to Clay's visionary leap, there's an alternative that's recycle-sensitive, environmentally sound, and will make serious listers who died before this new category was implemented turn green with envy. Consider the merits of using your earthly remains to attract birds. I say if a body is good enough to push up daisies, it's good enough to pull down a few birds.

I'll bet you think the possibilities are limited, right? A couple of vultures, crows, ravens, magpies, or maybe an eagle or two. Certainly nothing worth dying for.

Ah, but just set your mind to it and let your imagination run. Consider, for instance, how many birds you could attract just by hanging out a few locks of hair. Consider northern orioles!

ILLUSTRATION BY JEFF SIPPLE

Everybody who read the same out-of-date books as I did when I was growing up knows that orioles suspend their nests from strands of horsehair. But ever since the internal combustion engine was slapped on a chassis, orioles have had to struggle to find enough hair. For all anybody knows, oriole populations might have crashed as a result of Henry Ford's invention.

Well, if the idea of a death list catches on, we could have orioles nesting from every limb—and you, Mr. or Ms. Parts Donor, would be an integral part of the recovery program. Wouldn't that be better than having your dust gathering dust in a plastic-lined box in the closet while friends and relatives debate whether to spread your ashes at Hawk Mountain or Cave Creek Canyon?

Consider bones! Ospreys will carry anything to their nests. Imagine one of your very own ribs feathering an osprey nest, tucked right in there with the fishing line and broken beach chairs. Imagine having a lammergeier putting a shinbone of yours into free fall. Wouldn't you just die to have a bubbly little house wren singing from the occipital orbit of your very own philanthropic noggin? And every species of bird you attract would count as one on your death list.

Few places exist where the ranges of house wrens and lammergeiers overlap—none in fact. Like generating a big life list, mustering a big death list demands mobility, and since death is somewhat immobilizing, serious death listers will need help spreading their wealth around. No doubt there will have to be different categories for single-assist death lists and multiple assists.

A Death List Rules Committee will also have to address things like secondary (fatal) attractants. Can a body, for instance, claim a Say's phoebe that is attracted to the insect hatch associated with strategically placed viscera (but not the viscera itself)? Does a golden bowerbird count if it stashes one of your gold-filled molars in its bower (but ignores cavity-free teeth)?

And getting back to skuas, if some vital organ is merely added to the chum, does any skua that plops down in the slick count, or does a body only get credited with an assist?

These questions and others remain. But the potential of this new category is so limitless it fairly takes your breath away. After all, a life list only lasts a lifetime, but a death list lasts as long as you do. ■

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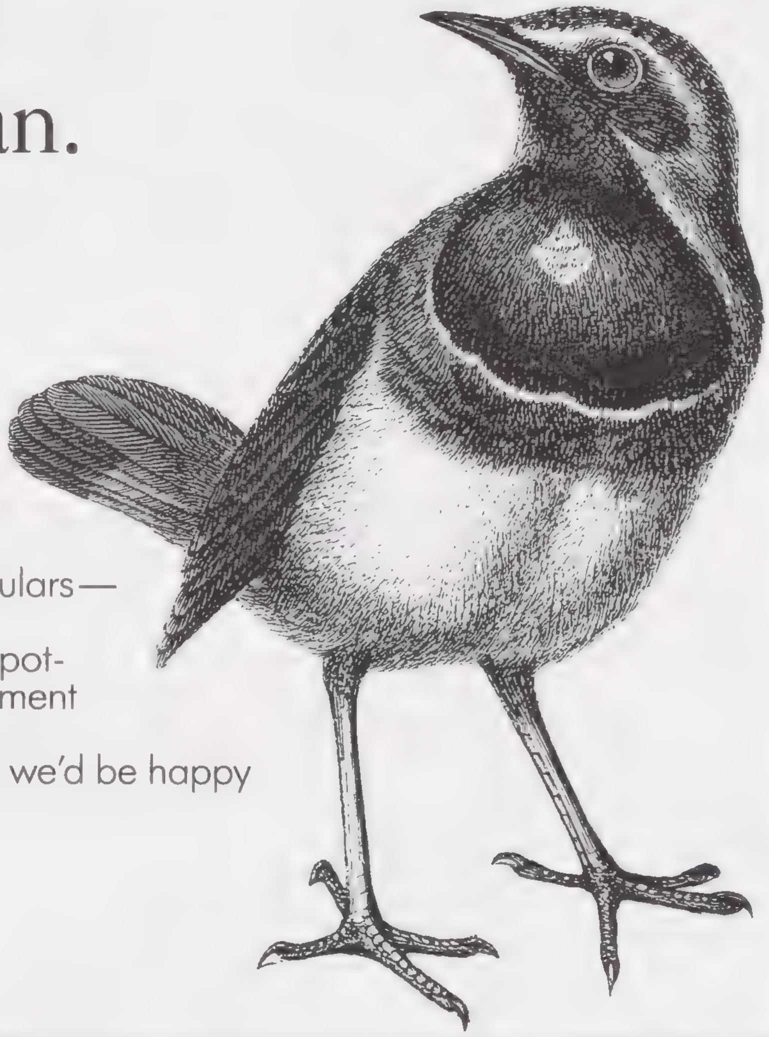

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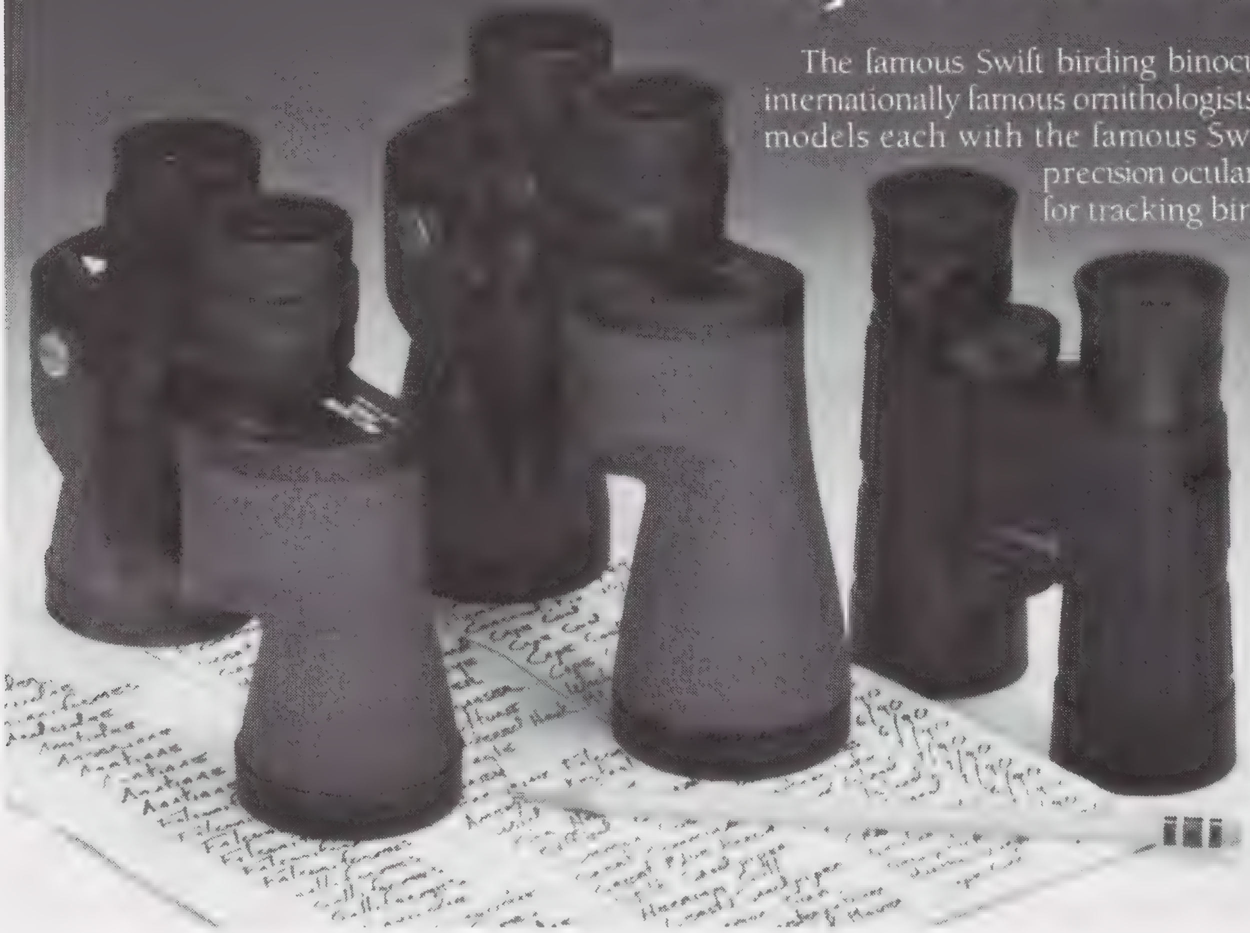

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LIVING BIRD

AUTUMN 1993 VOLUME 12 NUMBER 4

Greetings from Sapsucker Woods

The longer I live, the more I believe in serendipity. Take, for example, the first time I glanced through the pages of Arthur Cleveland Bent's *Life Histories of North American Birds of Prey.* I was 12 years old and a confirmed raptorphile even then. I opened the book and found the most beautiful picture of a peregrine falcon eyrie I'd ever seen. An adult peregrine stands guard on a branch not far from her nestlings, as a huge waterfall thunders down behind her. The setting was Taughannock Falls, near Ithaca, New York, and the photographer was none other than Arthur A. Allen, co-founder and first director of the Cornell Laboratory of Ornithology.

Years later when I came to Ithaca to be interviewed for the position I now hold, I told Scott Sutcliffe, the Lab's executive director, how moved I had been by Allen's photograph. He told me that he lived near the falls and would be happy to drive me there. Later that afternoon, I took him up on his offer. Taughannock Falls was even more impressive than I'd expected—a lofty cascade of water dropping more than 200 feet into a picturesque gorge. Seeing that view, as much as anything else, convinced me that I should move to this area and work at the Lab.

This spring my daughter, Clara, was born in a hospital less than two miles from the falls. As my wife, Rachel, and I made our way to the delivery room, we noticed that the hospital walls were decorated with numerous bird paintings by legendary Ithaca artist Louis Agassiz Fuertes. Several hours later, after Clara was born, I left the delivery room and strolled down the hall to get a drink. Right above the water fountain hung a stunning Fuertes nest portrait—a peregrine falcon at Taughannock Falls.

And talk about serendipity: the pediatric nurse who gave my daughter her first post-hospital checkup was Joan Allen, Arthur Allen's daughter-in-law.

Tim Gallagher
Editor-in-Chief

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Cover: Nature photographer Art Wolfe's evocative portrait captures the essence of the prairie falcon's realm—the rugged, windswept crags of the arid West. Lofty cliffs overlooking vast open areas of desert or grassland serve as nest sites, roosts, and lookout perches from which falcons can launch high-speed attacks on their prey far below.

Above: Arthur Allen's view of Taughannock Falls. Courtesy Bird Photographs, David G. Allen.

Back Cover: A stunning scarlet tanager perches high in a pine in a Northeastern forest. Like many other small neotropical migrants, tanagers require woodland habitat both here and on their wintering grounds in Central America. To find out what some Maine timber companies are doing to preserve nesting habitat for these and other birds, read the article on page 14. Photograph by Mary Stibritz.

LIVING BIRD

AUTUMN 1993 VOLUME 12 NUMBER 4

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts. © 1993 Cornell Laboratory of Ornithology.

Printing by Cayuga Press, Ithaca, New York
Color separations by Brodock Press, Inc., Utica, New York

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Letters

Eastern bluebird by Wayne Lankinen

How About a Duplex?

[Regarding the letter to the editor in the Winter 1993 issue that asked how to prevent tree swallows from nesting in bluebird boxes], I read recently that if a swallow box and a bluebird box were placed back to back, both could be occupied. Is this feasible?

Harry E. Taylor
Bradford, Pennsylvania

Cornell ornithologist David Winkler replies: This strategy has worked well for great tits and blue tits in Great Britain. It would probably work here, because bluebirds settle in earlier than tree swallows. A bluebird pair probably would not allow other bluebirds to nest that close, but might tolerate tree swallows.

Life on the Farm

I was interested in Tim Gallagher's article in the Spring 1993 issue of *Birdscope*, "Can Birds Coexist with Agriculture?" I have lived in Delaware County, New York, all my life and have been a bird watcher ever since I took a course with Arthur A. Allen in 1928.

In Delaware County, hay and corn are the main crops and very few insecticides are used; my son uses none. I believe the meadowlarks and bobolinks are so scarce now because of early cut hay. A farmer a short distance from my house does not cut his hay as early as my son does. His farm is the only one where I saw bobolinks when I used to participate in spring bird counts. I have not seen or heard a meadowlark in several years.

I do not know what could be done to remedy this, except to persuade farmers to leave a part of a field untouched until the nesting season is past.

Although I can no longer go birding in the woods and pastures, I know there are many fewer birds than there used to be, and I'm sure there are many reasons for it. Conservation organizations are doing a lot, but even more must be done.

Mildred Truscott Clark
Delhi, New York

Bombs Away

Jack Connor's article on shell-dropping gulls ("The Shell Game," Summer 1993) caught my attention. I live in Delaware, right on the bay near the Indian River inlet. We have an active "air force" around here, continually trying their precision bombing. Their targets are my little pier (made of wood, but apparently hard enough) and, for higher level bombing, the blacktop road in front of the house (it's really white now). Their bombs are clams, oysters, mussels, and crabs.

I am not that good at identifying gulls, but a lot of them are herring gulls. The laughing gulls are all around, but don't drop shells as much. They never drop shells in the summer—always in fall, winter, and spring.

And their precision! They hardly ever seem to miss. They don't use the piers on either side of me, just mine. We built the house in 1986—before that it was open space on the marsh—and the gulls have been dropping shells ever since.

We were in Holland in spring 1993 and did not see any drop zones, even though we traveled up and down all the canals on a small riverboat.

Amos F. Hutchins, Jr.
Ocean View, Delaware

We welcome letters from readers. Address letters to: The Editors, *Living Bird,* 159 Sapsucker Woods Road, Ithaca, New York 14850.

ORNITHOLOGIST GETS GENIUS GRANT

Ornithologist Heather Williams has been awarded a $240,000 MacArthur Fellowship. Popularly called "genius grants," the MacArthur awards are five-year, "no strings attached" stipends intended to recognize creative individuals in socially significant fields. Funding comes from the John D. and Catherine T. MacArthur Foundation.

Williams, an assistant professor at Williams College, has made significant contributions in the study of mechanisms for song learning in birds and was the first to describe how birds process the songs they hear with the motor pathways normally used for sound production. She is one of 31 new MacArthur Fellows for 1993.

'ALALA UPDATE

In our Spring 1993 issue we reported that the endangered Hawaiian crow faced an uncertain future, its population reduced to 13 birds in the wild and 11 in captivity. But the crow, also known as the 'alala, just got a big population boost—seven new chicks.

This past April, acting on the recommendations of a National Academy of Sciences panel, U. S. Fish and Wildlife Service (USFWS) biologists took seven eggs from two wild crow nests. The precious eggs were whisked to a new USFWS facility on the island of Hawaii, and three weeks later, six hatched.

Meanwhile, both pairs of wild crows re-nested. Unfortunately, both nests failed, so when one pair produced a third clutch, biologists removed the one viable egg to an incubator. It later hatched, bringing the new chick total to seven.

Keepers have been feeding the chicks using a crow hand puppet so they won't imprint on humans. Recently, five of the chicks were transferred to a special hacking facility where they are being taught how to live in the wild. Some should be released to the wild any day now. Another chick was added to the captive flock of 11 birds on the island of Maui.

Taking the lead in the 'alala recovery effort is The Peregrine Fund, chosen by the USFWS for its past successes in restoring endangered raptor populations. The organization is a former Cornell Lab of Ornithology program that's now based at the World Center for Birds of Prey in Boise, Idaho.

LON E. LAUBER

The latest import model: Aleutian Canada goose comes to Russia

TO RUSSIA WITH LOVE

Western imports are popular in Russia: blue jeans, rock music, fast-food restaurants, and now the Aleutian Canada goose. The United States recently donated 19 adult geese to Russia for a captive breeding program that aims to restore the endangered species to its original Asian range. The geese flew aboard an Aeroflot jetliner to Russia last September to take up residence in a new facility on the Kamchatka Peninsula.

The Aleutian goose, a subspecies of the widespread Canada goose, formerly existed as two discrete populations, one that bred in Russia and wintered in Japan, and one that bred in Alaska and wintered in California. Early in this century, fox farmers established operations on the islands where the birds nested, and escaped foxes wiped out the Russian population.

The U.S. population was also decimated, but rebounded in the 1960s thanks to a captive breeding program. At present the small geese number about 8,000—enough for the species to be "downlisted" from endangered to threatened status here.

Now Russia hopes to repeat this success. USFWS biologists are serving as advisors for the recovery effort, and biologists from Japan, where the geese winter, are also involved—making the program a striking example of international cooperation for bird conservation.

IN MEMORIAM

The conservation community suffered an irreplaceable loss this past August with the death of **Theodore A. Parker III.** Parker, Ted to his friends, was the world's leading authority on tropical bird biology. He had spent most of his adult life in the tropics, studying birds and recording their sounds. In addition to being a member of the Lab's Administrative Board, Ted was the single largest contributor to the Library of Natural Sounds, donating more than 10,000 recordings since 1978. His abilities as an ear birder were legendary—he could identify nearly 4,000 species by sound alone.

Ted Parker was one of the greatest field biologists of this century—a courageous scientist who devoted his life to the study and conservation of tropical ecosystems. As director of Conservation International's Rapid Assessment Program, he led teams of biologists into threatened habitats in Central and South America, attempting to catalog the biodiversity of an area quickly. During an aerial survey of a cloudforest in Ecuador, the airplane the team was using crashed, killing Ted, botanist Alwyn Gentry, and three others. Ted Parker's loss cannot be adequately expressed. Though he was only 40 years old, his accomplishments were remarkable. It is impossible to estimate how much more he might have achieved had he lived longer. He will be greatly missed.

Lawrence H. Walkinshaw, a longtime friend of the Lab and a major contributor to our Nest Record Program, died this past January after a short illness. A Cornell graduate fellowship is being endowed in his honor. Contributions may be sent to Scott Sutcliffe, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850.

COMPILED BY CYNTHIA BERGER

ALASKA OIL SPILL—FOUR YEARS LATER

In March 1989 the tanker Exxon Valdez *dumped nearly 11 million gallons of crude oil into Alaska's majestic Prince William Sound. Seabirds bore the brunt of the damage: researchers estimate that from 200,000 to 645,000 birds were killed outright. Now, four years later, some scientists worry that the lingering effects of the spill may delay recovery for some species.*

JOHN HYDE (2)

Alaska's tufted puffin population was largely unaffected by the Exxon Valdez *spill.*

At the *Exxon Valdez* Oil Spill Symposium held this past February in Anchorage, Alaska, researchers presented the results of dozens of wildlife surveys and censuses conducted in the years since the spill. The symposium was sponsored by the *Exxon Valdez* Oil Spill Trustee Council, the Alaska Sea Grant College Program, and the Alaska Chapter of the American Fisheries Society.

The researchers reported that some bird species suffered little harm. Puffins, for example, were wintering on the open ocean, far from the spill's path. And although 11 percent of the region's bald eagle population was killed, the species is now well on its way to recovery. Other birds, however, were not so lucky.

MURRES

Common and thick-billed murres are two of Alaska's most abundant seabirds, with a combined population of about 12 million. Soon after the spill, wind-blown oil engulfed an estimated 140,000 murres as they gathered in huge rafts near the islands where they breed. "We believe that up to 60 percent of the breeding population in one colony was killed by the oil spill," said D. Michael Fry, a research physiologist at the University of California, Davis. Overall, populations in the path of the spill may have declined by 40 to 60 percent.

Harlequin ducks may go extinct in some areas, a result of foraging on still-contaminated shellfish.

Vernon Byrd, a U. S. Fish and Wildlife Service (USFWS) biologist at the Alaska Maritime Wildlife Refuge, believes the spill may have also disrupted the timing of breeding. Young murres learn breeding behavior by imitating adults; the loss of so many adult birds left young birds without role models. Furthermore, egg-laying was pushed back from June to July because of the spill, and birds in the oil-affected colonies have continued to delay their nesting—in 1990 and 1991 murres bred almost a month later than normal. As a result, their offspring have suffered increased mortality from predators and early winter storms. Scientists speculate that murre colonies have produced 300,000 fewer chicks than normal from 1989 to 1991.

"Murres are beginning to nest normally in two colonies that were affected by the spill," says Byrd, perhaps because the birds are now older and more experienced. Still, Dennis Heinemann of Manomet Bird Observatory warns that total recovery may be very slow. Drawing on other studies of murre populations, Heinemann points out that even with a 4 percent annual growth rate—the maximum observed for murres so far—the oiled colonies could take as long as 18 years to fully recover.

SEA DUCKS

More than 2,000 sea ducks were killed in the spill, including harlequins, goldeneyes, and scoters. Harlequin ducks forage in the shallowest waters—the area most affected by the oil—and are continuing to feel the effects of the spill. According to Sam Patten, Jr., a biologist with the Alaska Department of Fish and Game, harlequins in oiled areas have been almost completely unable to breed in the past four years, whereas harlequins in unoiled areas are reproducing normally. Studies also showed that ducks in the oiled zone had petroleum hydrocarbons in their tissues and were generally in poor condition during the winter of 1989-90.

Oil-contaminated blue mussels, a favorite harlequin food, may be to blame. "Blue mussels concentrate and hold pollutants in their tissues," says Patten. "Unless measures are taken to remove oil from mussel beds, a local extinction of harlequin ducks may occur."

OTHER SPECIES

Marbled murrelets, listed as threatened in the Pacific Northwest, have large populations in Alaska but are still considered a species of special concern there. Murrelet populations in Prince William Sound have been declining since the 1970s. But the oil spill didn't help matters—between 8,000 and 14,000 birds were killed outright.

Pigeon guillemot populations were also declining before the *Exxon Valdez* disaster. Scientists estimate that 1,500 to 3,000 guillemots—about 10 percent of the total population in the Gulf of Alaska—were killed in the spill. New data show that in the years following the spill, population declines have been greater in oiled areas than in unoiled areas.

Only nine black oystercatcher carcasses were found after the spill, but data suggest that lingering oil and the commotion caused by cleanup activities in some spill areas have reduced the amount of food available on beaches where oystercatchers forage and nest. In the oiled zone, oystercatchers laid fewer eggs than normal, and the chicks that did hatch gained significantly less weight than chicks in oil-free areas.

The carcasses of many other bird species, including loons, cormorants, gulls, and grebes, were recovered after the spill. But the overall effects of the spill on birds may never be known, because good information on pre-spill population levels just doesn't exist for some species.

A Sound Idea?

U. S. Fish and Wildlife Service biologists are considering a plan to help restore common murre populations at oiled sites in Prince William Sound by broadcasting tape-recorded sounds of breeding murres over loudspeakers. They hope that the sounds of a noisy breeding colony will help stimulate the remaining birds to breed at the right time. These researchers are especially interested in the work of Stephen W. Kress, a National Audubon Society biologist and Cornell Lab of Ornithology associate who makes Sapsucker Woods his home base.

Kress pioneered the use of recorded sounds and lifelike decoys to restore locally extirpated Atlantic puffins, roseate terns, and Leach's storm-petrels to their historic breeding grounds. His newest project involves attracting common murres to an island in Penobscot Bay, in Maine; murres last nested in the bay in 1840.

In the summers of 1992 and 1993, Kress and his research team set out lifelike murre decoys and played recordings specially prepared by the Lab's Library of Natural Sounds. The first summer, the team spotted several murres investigating the decoys and performing breeding behaviors; this year, almost 20 birds showed up. This summer, Kress also tested the relative attraction powers of different recordings—the sounds of a small colony, a large colony, and a colony with chicks.

SUSAN SCHUBEL

Courtship feeding by common murres, attracted to a Maine island by lifelike decoys and the sounds of a breeding colony. Will attraction techniques work in Alaska?

"We've demonstrated that the combination of sounds and decoys attracts murres to a site where they aren't currently nesting," says Kress. "The Alaska proposal is controversial, however, because murre colonies there still have many birds. It would take carefully designed controls to determine whether broadcasting sounds really helps, or whether the birds are recovering on their own."

The USFWS is expected to make a decision about the Alaska murre recovery plan in 1994.

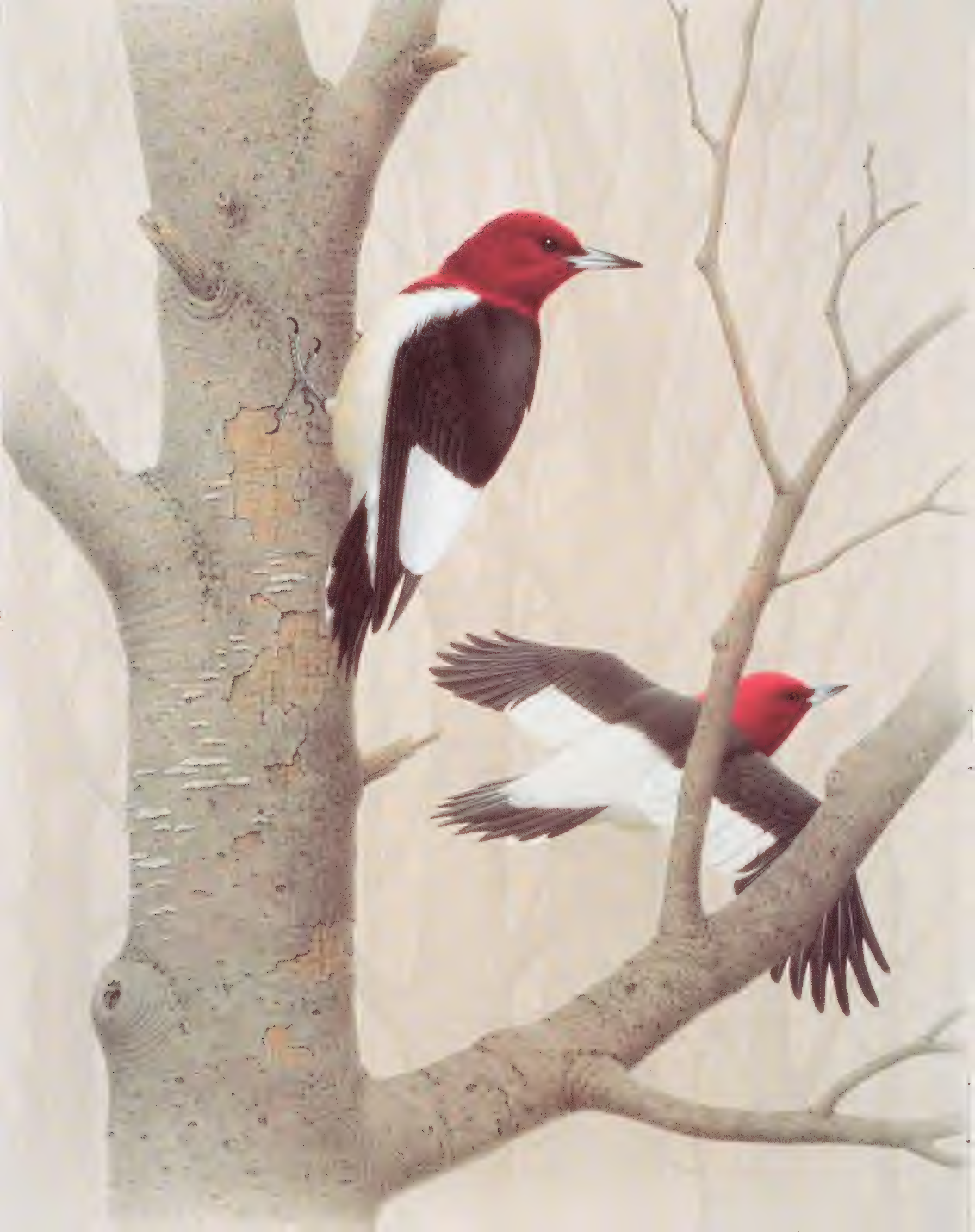
LOOKING TO THE FUTURE

Scientists are looking for ways to help seabird populations recover. To aid harlequin ducks, they recommend removing oil from contaminated blue mussel beds. Marbled murrelets will benefit if the old-growth forests in which they nest are protected. One of the most innovative ideas being proposed involves common murres: some USFWS scientists think the birds can be stimulated to breed at the right time by broadcasting the raucous sounds of a dense colony (see sidebar, above right).

Even after years of research, scientists can only speculate about the spill's long-term effects on seabirds. Some researchers dispute the official estimates of seabird deaths, saying the total number killed was probably closer to 200,000, than to 645,000. And ironically, another oil spill may not be the greatest threat that seabirds face. Many seabird populations in Prince William Sound were already declining in the years leading up to the spill, possibly as a result of commercial fishing and naturally occurring food web disturbances, which together have depleted the birds' food supply.

The only thing that scientists can agree on is that we don't yet have a complete picture of the spill's effect on Alaska's coastal ecosystem. Says USFWS biologist John Piatt, "We need to explore other hypotheses as to why bird populations were on the decline, rather than blame everything on oil." —*Rich Andresen*

Rich Andresen is an environmental reporting intern at the Alaska Sea Grant College Program, headquartered at the University of Alaska School of Fisheries and Ocean Sciences in Fairbanks, Alaska. Alaska Sea Grant is a marine research, education, and outreach service funded by the National Oceanic and Atmospheric Administration in partnership with the State of Alaska and private industry.



Life Histories: Past, Present, and Future

by Kristi G. Streiffert

As A.C. Bent's venerable books on North American birds move toward antiquity, a new reference series aims to take their place

Whether I visit Newburyport in winter, High Island in spring, or a local park on my way home from work, I always return from birding excursions with more than just new birds for my lists. I come home with mysteries to solve: How does an oriole attach its nest to a tree limb? How far can turkeys fly? How far north do great blue herons winter?

I'm not the first person to ask these questions. Legions of bird watchers, naturalists, and ornithologists have gone into the field in the decades and centuries past, studying firsthand the complex natural history of North America's birds. Today's birding detectives can look through their predecessors' eyes and make use of the wealth of information they set down.

To help breathe new life into Bent's 21-volume series, Indiana University Press plans to publish deluxe editions of each volume. The first volume, Life Histories of North American Woodpeckers, *already published, features 25 color plates by wildlife artist William Zimmerman. At left, from the new volume, a pair of red-headed woodpeckers.*

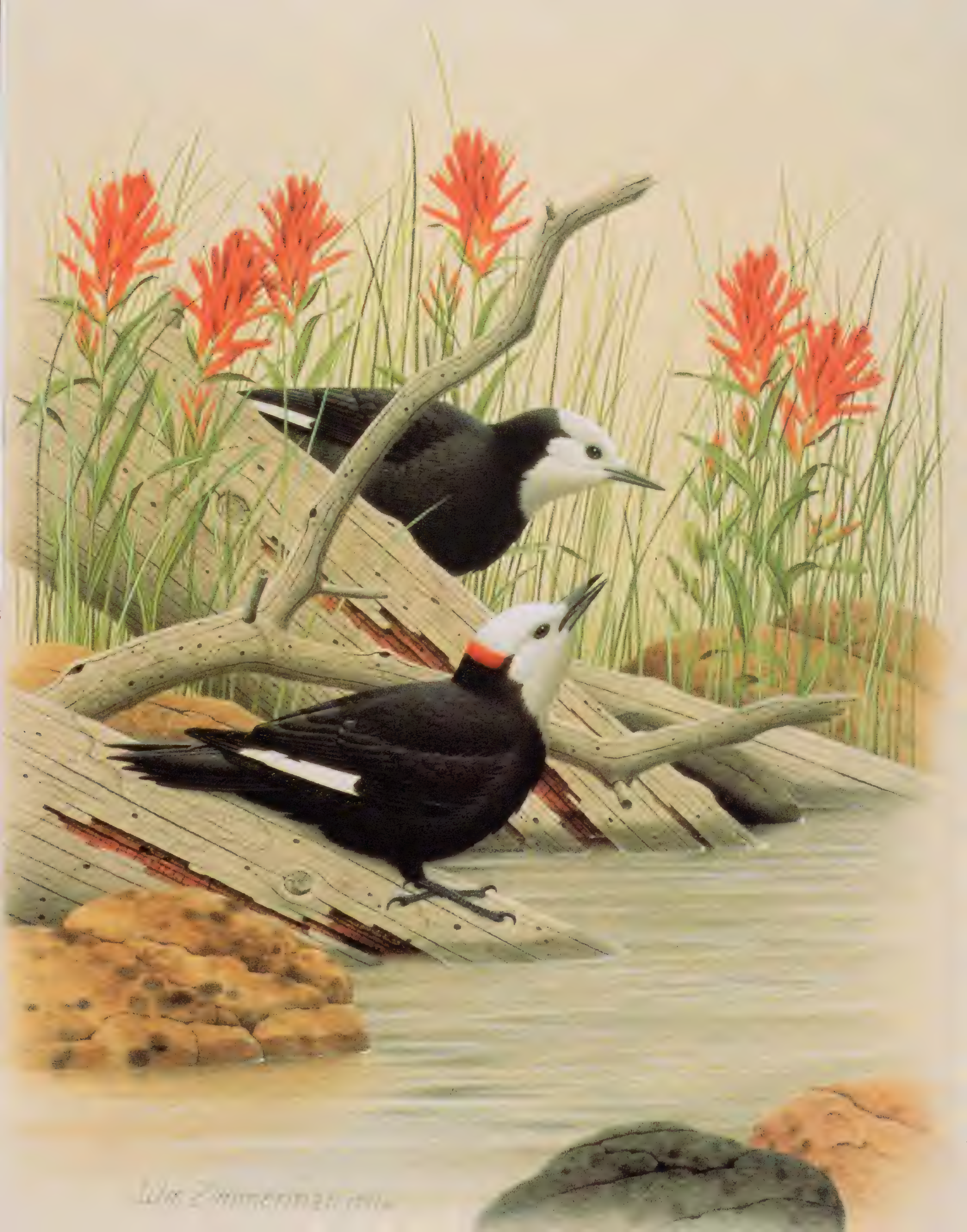
William Zimmerman (Courtesy Indiana University Press)

Two of the best references available for birders are almost complete opposites. One is approaching antiquity, the other won't be complete for eight years. One is romantic, the other academic. One might be read by the fireplace, the other seems more at home on a desk. But wherever you use them, having both on your bookshelf will make avian sleuthing a cinch.

For many years, the bird quester's first source has been the classic 21-volume series, *Life Histories of North American Birds*, compiled by Arthur Cleveland Bent. Though readers expecting the subdued tones of modern research might at first be exasperated by the anecdotal style of the books, most come to cherish the firsthand accounts by Bent and the hundreds of correspondents he quotes. "I love Bent's style of writing," says bird artist William Zimmerman. "His enthusiasm and ability to build a relationship with birds enhances my skills and appreciation immeasurably."

The narratives in Bent's *Life Histories* include dozens of entries from esteemed early naturalists such as John Burroughs, John James Audubon, and others. Each species account provides detailed facts about the habits of the bird, its food, plumage, voice, range, courtship, nesting, migration, and behavior. When I look up the nesting habits of the "Baltimore" oriole, I read that "the oriole is perhaps the most skillful artisan of any North American bird." The section quotes several naturalists and concludes with two pages describing exactly how the birds weave materials to produce a nest. "The first strands of bast, which are apt to be long, are wound around the chosen twig rather loosely with one or more turns . . . but subsequent modes of treatment tend to draw these threads tighter. . . ." Reading such intricate details inspires me to go out and search for an oriole to watch . . . really watch.

Some birders use Bent's detailed reports to help them find target birds. William Zimmerman tells of a trip to Alaska: "I used Bent's almost like a map. It was exciting to see flocks of Pacific, Steller's, and spectacled eiders, black brant, cackling and emperor geese, all arriving on the coast to breed exactly where Bent and his colleagues had said they would be." But others have tried to use Bent's *Life Histories* in the same way, only to find a shopping mall instead of the promised wetland.



This should not be too surprising, considering that World War I was just ending when volume 1 of the series was published by the Smithsonian Institution. Volume 21 appeared 58 years later in 1968. More than just habitat has changed in the ensuing decades.

"Certain aspects are obsolete," says Ken Parkes, senior curator of birds at the Carnegie Museum of Natural History. "Distributions and migration dates, for example. Also, plumage descriptions are all based on Jonathan Dwight's 1900 work, with virtually nothing added or changed. And there are the eternal problems with names of birds."

The American Ornithologists' Union (AOU) has made many new determinations concerning both taxonomy and nomenclature, and will continue to do so. "But this is the least important problem," Parkes continues, "as long as you know what kind of bird you are looking at."

Attitudes and outlooks have also changed since Bent's work was completed. His accounts describe the great black-backed gull as a "merciless tyrant" and the courtship displays of the horned grebe as "love affairs." But these sometimes startling anthropomorphisms only add appeal to the accounts. Less appealing, but nevertheless indicative of the times, are the many accounts of collecting eggs and specimens of the birds observed.

Bent traveled widely, gathering information on birds, taking photographs to illustrate his work, and adding to his collections. His bird skin collection alone included over 1,000 species, and his 30,000 eggs represented more than 900 species. Considering that he was a full-time businessman, a devoted community leader, and a family man, his achievements are astounding. But he did not work alone. As naturalists and ornithologists became aware of his efforts, Bent built up a network of over 500 correspondents who wrote to him from all parts of the country.

However, Bent's copious information on each bird, as valuable and interesting as it may be, is not always totally reliable. His information came from an army of observers, both amateurs and professionals, and much of it was unreviewed, according to Kevin McGowan, curator of Cornell University's bird collection. "Some of Bent's material is suspect," he says. "In the fish crow account, for example, he talks about breeding birds displaying and showing their 'red beaks.' No adult crows have red on them anywhere, only juveniles. It leads me to wonder if what is listed as courtship is really parent-offspring or sibling-sibling interactions."

Nevertheless, these volumes are irreplaceable, if only for the morsels of fascinating information they contain. Bent provides many of the old common names that conjure up vivid images in our minds. The pied-billed grebe, for example, was known as the "water witch," while the green-backed heron was aptly called "fly-up-the-creek."

First-hand descriptions of lost habitats or species now nearly extinct provide haunting reading. We're told of the prairie nesting habits of the whooping crane, "years ago, when Northwest Iowa was a vast prairie." California condor habitat is described as "far from the haunts of man." In the "remote vastnesses of untamed wilderness" of Southern California, Bent says, the condor "may long continue to exist."

Famed amateur ornithologist Arthur Cleveland Bent, center above, stands on the quarterdeck of the cutter Tahoma *during a collecting trip to Alaska in 1911. Far left, this intimate portrait of a white-headed woodpecker pair is another example of William Zimmerman's art from the new deluxe edition of Bent's volume on woodpeckers.*

Left: William Zimmerman (Courtesy Indiana University Press). Right: Courtesy Smithsonian Institution Archives—Alexander Wetmore Papers.

Another of Bent's topics still useful to ornithologists is bird reproduction. "The information on eggs, egg laying, and incubation is excellent," says Burt Monroe, University of Louisville ornithologist and past president of the AOU. "A robin's egg is still blue, no matter when it was recorded," adds Parkes.

Bent's *Life Histories of North American Birds* are now published by Dover Press, but a newcomer to the field, Indiana University Press, has added fresh life to the series by publishing a deluxe edition of *Life Histories of North American Woodpeckers,* featuring superb color illustrations by artist William Zimmerman. "We hope to republish the blackbirds volume next," says Zimmerman, who is already at work on the paintings. The project is moving fairly slowly, since the artist must sell his original paintings (at about $2,500 each) before publication to fund the series.

In the meantime, editor Alan Weissman at Dover Press says, "We have no plans to drop the *Life Histories,* even though sales are sometimes very modest. We keep most of them in print even though we may sell only a few hundred a year."

As Bent's *Life Histories* advance toward antiquity, a new series has started that will help carry bird studies into the 21st century. *The Birds of North America* (*BNA*) is a joint project of the AOU and the Philadelphia Academy of Natural Sciences. Though only one volume has been published, the completed series will take up 6 feet of bookshelf space and provide 14,000 pages of detailed information on 700 species, representing a distillation of the latest research.

Each life history account will be written by an expert on the species, using both information from recent investigations and reliable literature from the past. Some accounts will be authored by ornithologists with many years of experience, others by comparative youngsters, but the information should be relatively error free. According to Burt Monroe, each account will be reviewed by a panel of experts. "Frank Gill [executive director of the project] won't let anything slip by," says Monroe.

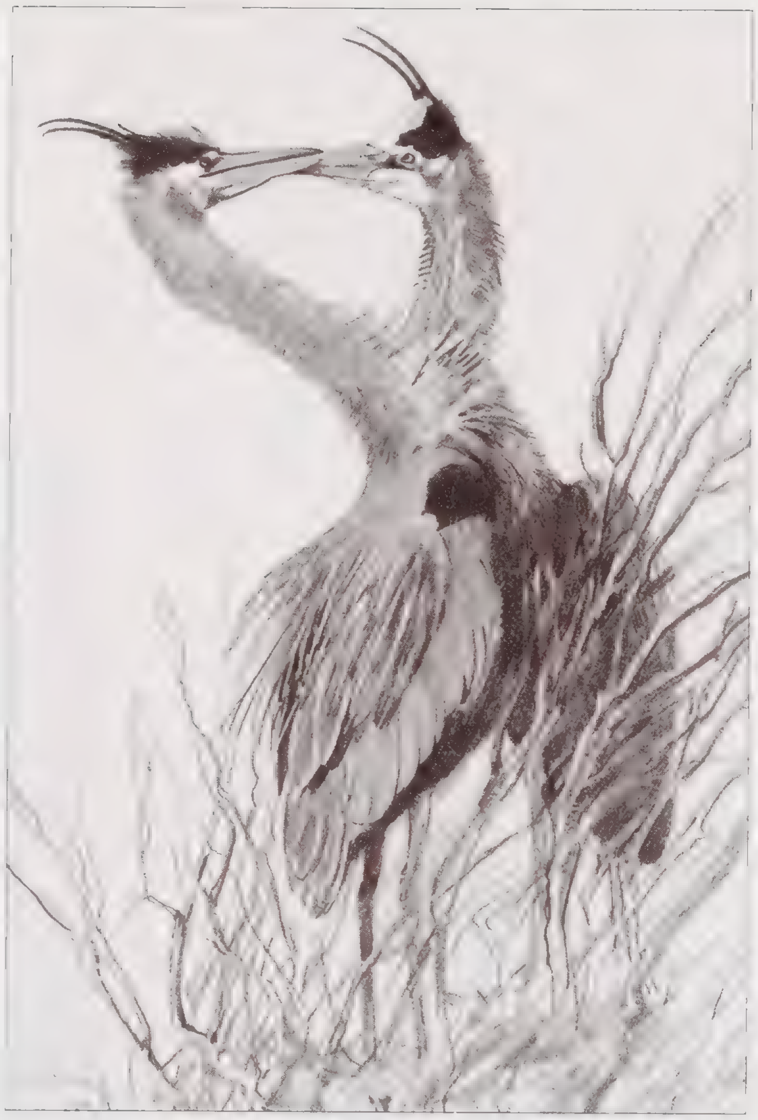
Bent's *Life Histories* currently have an advantage over the *BNA*, simply because the series is already complete and readily available. The new series is being published in the order that the experts complete their work. "It will be a long time before you'll be able to compare different species of woodpeckers using *BNA*," says Parkes.

"To get this project completed in just ten years, we are publishing each species separately. Other projects have died from taking too long," says Gill. The 20-page, magazine-format accounts are published in batches of 8, with 24 in each completed volume.

Each account provides details about breeding, life span, and population, a color-keyed map indicating the species's range, and a graph of the bird's annual cycle of breeding, migration, and molt. "This series is far more comprehensive than Bent's and is sorely needed," says Monroe, who is currently chairman of the AOU Checklist Committee.

"*BNA* includes many things that Bent could not," says Gill, "like physiology, systematics, communal and social behavior, and especially evolutionary information. We can answer some of the 'why' questions.

"I was interacting, whistling to a saw-whet owl last spring," Gill continues, "and wondering: Is this owl mated? Why is he singing so late in the spring? When I got the manuscript for the saw-whet owl, everything was described just as I'd seen it and I got all the answers to my questions. This is how birders can use *The Birds of North America.* It is a way to con-



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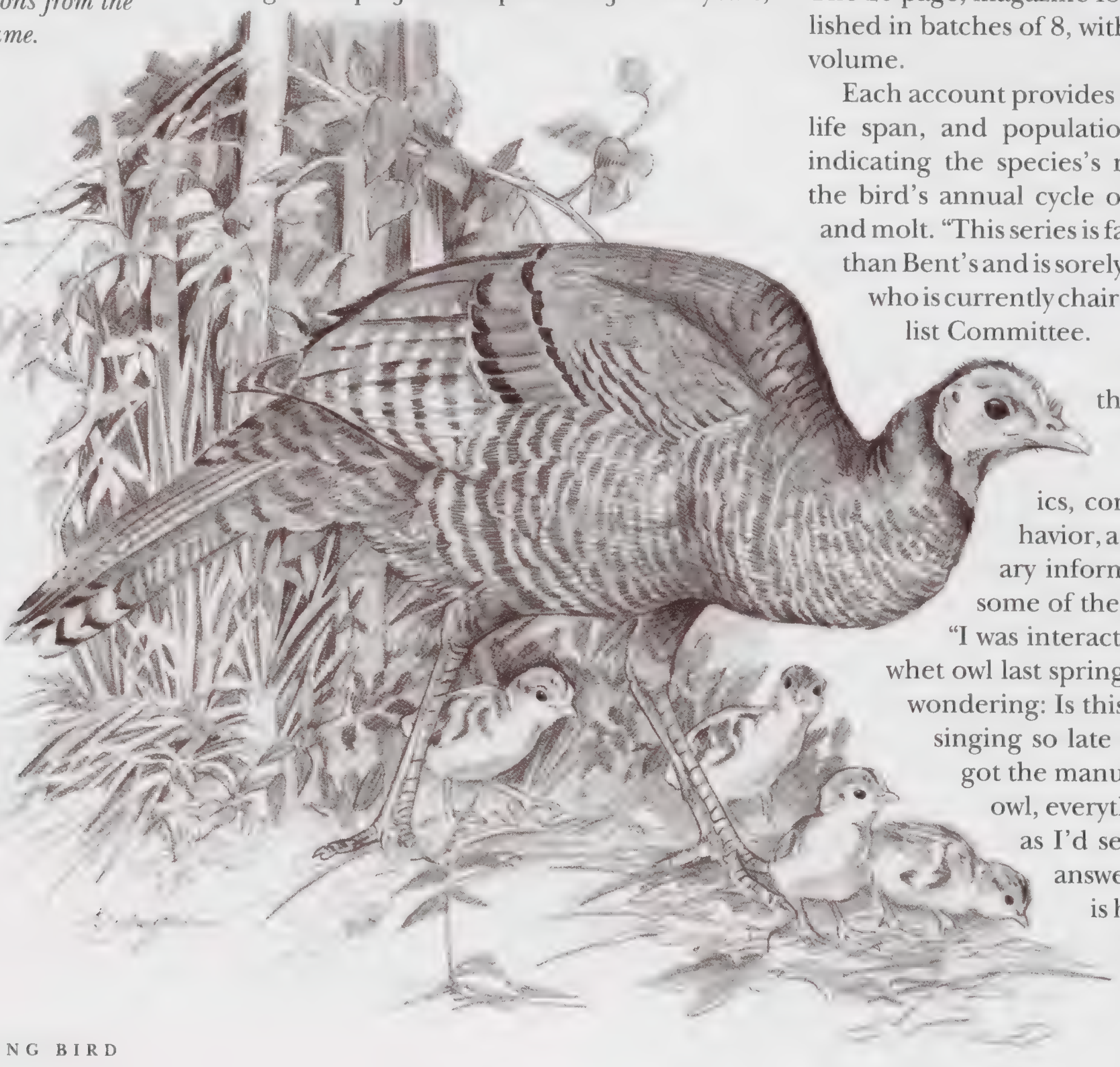


JULIA ZICKEFOOSE

A new series, The Birds of North America, *aims to pick up where Bent left off, providing a bird reference work for the 21st century. Each volume contains 24 species accounts, such as the great blue heron and wild turkey life histories, far right, from the first volume. Two great blue herons, at right, cross bills in an aggressive encounter, and a mother wild turkey, below, protects her young in these illustrations from the first volume.*

nect with the birds, to be drawn into what they are doing. It will propel birders from ticking off birds on a list to knowing and appreciating the birds."

Of course, some subscribers intend to use the series to help with their lists, too. Outdoor author Carolyn Hoffman says, "I plan on using the density maps to find certain elusive birds." Another subscriber, Edward Pederson of New Providence, Pennsylvania, says, "I'll use the early and late migrating dates to target species." He also believes that the habitat descriptions will help him to locate species.

For researchers, *The Birds of North America* provides a new starting point, leaps and bounds beyond where they've had to start in the past, which was usually with Bent. "The References section alone is worth the price of the subscription," says Gill. "It will save many hours of library time."

And Gill's vision for research is not limited to professional ornithologists. "Subscribers will be astounded at what is not known about most species," he says, "and this is where the educated amateur comes in. Ornithology is a science that is based on the contributions of hobbyists. I hope this series will stimulate birders to learn and write about what is not known."

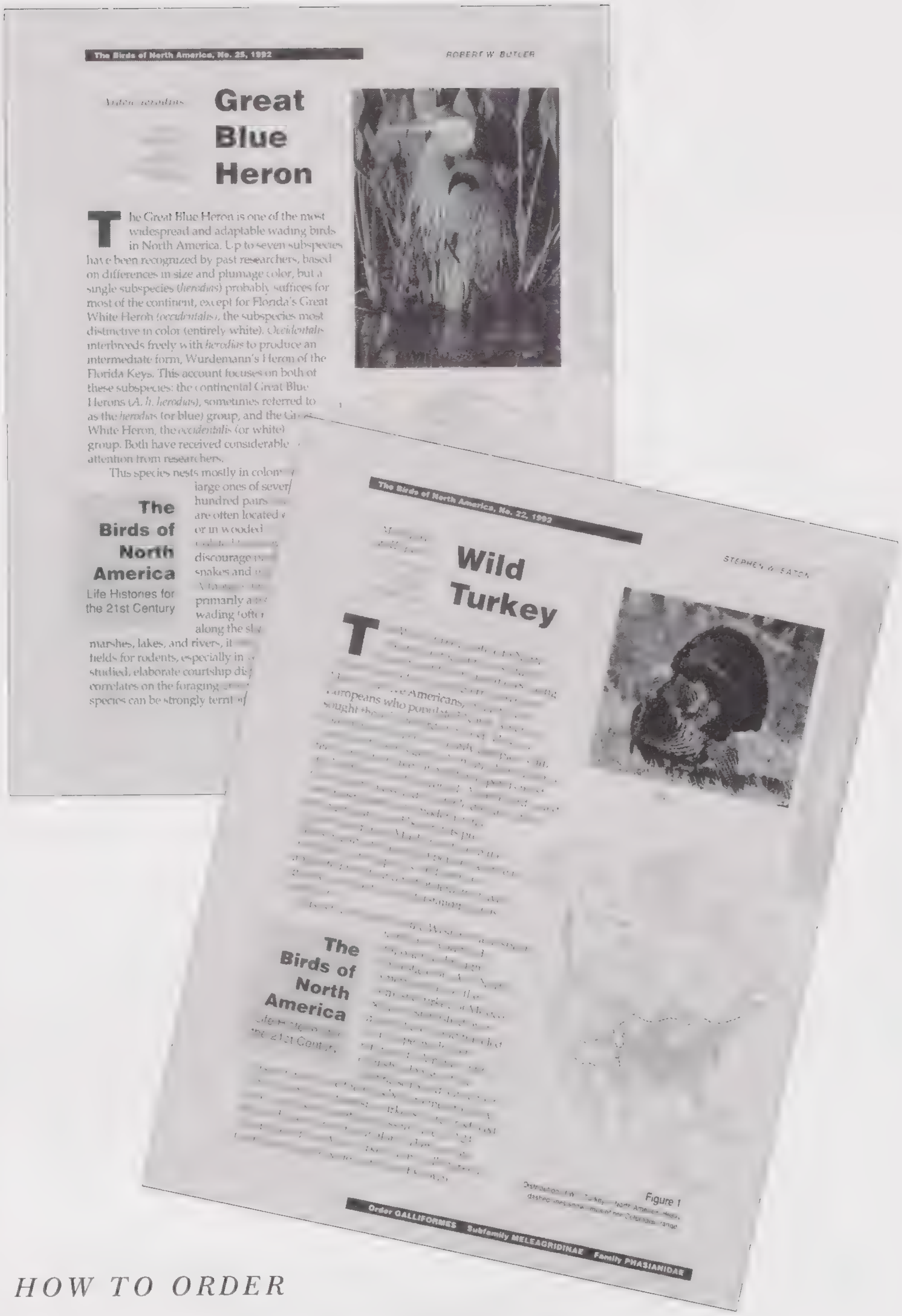
Resource managers make up yet another target audience for *The Birds of North America.* Nature center staffers, field biologists, and state natural resources decision-makers can all use the series to facilitate habitat supervision. Government organizations providing support for the series include the U.S. Fish and Wildlife Service's Office of Migratory Bird Management and the National Fish and Wildlife Foundation. Hundreds of other groups and individuals are also helping. The scientists authoring each species profile are volunteering their time to the project. "The authors are making a major investment of time," says Alan Poole, *BNA* editor. "This is a cooperative effort on the part of American ornithologists to make their knowledge available."

"Volunteers drive this project," says Gill. "I don't get paid, our board of advisors receives no honorariums. We have so many people pitching in, because they believe we need this series."

If volunteers drive the project, subscribers steer. Not only do early subscribers participate in supporting this remarkable (and expensive) project, they are also influencing its direction.

"Though we have a broad subscribership, we've discovered the birding community is really behind it, so our emphasis and tone is evolving to meet their needs and satisfy their interests," says Gill. ■

Kristi G. Streiffert is a freelance nature writer, currently based in Pennsylvania.



The Birds of North America, No. 25, 1992

ROBERT W. BUTLER

Ardea herodias

Great Blue Heron

The Great Blue Heron is one of the most widespread and adaptable wading birds in North America. Up to seven subspecies have been recognized by past researchers, based on differences in size and plumage color, but a single subspecies (*herodias*) probably suffices for most of the continent, except for Florida's Great White Heron (*occidentalis*), the subspecies most distinctive in color (entirely white). *Occidentalis* interbreeds freely with *herodias* to produce an intermediate form, Wurdemann's Heron of the Florida Keys. This account focuses on both of these subspecies: the continental Great Blue Herons (*A. h. herodias*), sometimes referred to as the *herodias* (or blue) group, and the Gr… White Heron, the *occidentalis* (or white) group. Both have received considerable attention from researchers.

This species nests mostly in colon… large ones of sever… hundred pairs… are often located… or in wooded… discourage… snakes and… primarily a… wading (ofte… along the sh… marshes, lakes, and rivers, it… fields for rodents, especially in… studied, elaborate courtship dis… correlates on the foraging… species can be strongly territ…

The Birds of North America
Life Histories for the 21st Century

The Birds of North America, No. 22, 1992

STEPHEN W. EATON

Wild Turkey

The Birds of North America

Figure 1

Order GALLIFORMES Subfamily MELEAGRIDINAE Family PHASIANIDAE

HOW TO ORDER

The Birds of North America—Price: $175 per volume; charter subscription, $1,875 for 18 volumes; installment subscription, three annual payments of $700. For a sample copy and subscription information, call (800) 345-8112.

Life Histories of North American Birds—Many of Bent's volumes, published by Dover Press, are available from the Crow's Nest Birding Shop at the Lab. Call for prices: (607) 254-2400. Most cost about $10. To order volumes directly from Dover, write first for a catalog. If the volume you desire is out of print, request it anyway; their supply is based on demand. Dover Publications, Inc., 31 East 2nd Street, Mineola, New York 11501.

Life Histories of North American Woodpeckers, with paintings by William Zimmerman—Price: $29.95. Indiana University Press, 601 N. Morton Street, Bloomington, Indiana 47404; (812) 855-8054.

The Working Forests of Maine

What's good for timber companies can also be good for birds

by Laurel Kornhiser

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As I drive my car deeper into the heart of Maine's North Woods, I am struck by the unbroken sea of green forest unfolding before me—a vista I'm not used to. I live on the coast of Massachusetts, and the roads I usually travel are congested, mini-mall-lined streets connecting look-alike housing tracts. The trees I see serve mostly as adornments for roadsides, gardens, and local parks. Such rampant development is now the norm through much of the northeastern United States. But Maine is an anomaly; 90 percent of the state is still forested.

Every half hour or so as I continue my journey, I pass through a town that may boast a population in the hundreds. But here, instead of seeing countless housing tracts occasionally interrupted by trees, I see forest tracts occasionally interrupted by houses. I am heartened and amazed that the observation Henry David Thoreau made nearly 150 years ago in his book, *The Maine Woods,* might still hold true: "Immeasurable forest for the sun to shine on . . . . No clearing, no house."

I am traveling to Greenville in the Moosehead Lake region of Maine to meet John Hagan, Manomet Bird Observatory (MBO) senior scientist, his research assistant Pete McKinley, and their seven field assistants. They are spending the summer in the Maine woods to study the effects of timber management practices on the neotropical migrants that breed there each summer.

Ironically, the Maine forest's usefulness as a source of timber products is the main factor that has preserved it from developers

Neotropical migrants are birds that breed in North America but winter south of the border, in Mexico, Central America, the West Indies, or South America. Gauging the population health of the some 250 species classified as neotropical migrants is a daunting task. Though most censuses show declines in many neotropical species, survey methods are not infallible. Banding data, such as that amassed by MBO in more than 25 years of bird banding, is affected by the vagaries of wind and weather. The Breeding Bird Survey (BBS) includes over 2,000 yearly surveys of 25-mile stretches throughout the country, but it relies on counts conducted along roadsides, which many neotropical migrants shun, preferring forest interiors. Still, banding and BBS data, along with images of migrating bird flocks picked up by radar, all indicate declining numbers of many songbirds, such as common yellowthroat, American redstart, Swainson's thrush, wood thrush, and chestnut-sided warbler.

John Hagan was hired by MBO in 1986 to analyze more than 200,000 banding records, searching for insights into bird population and migration trends. He began by examining recent research findings on neotropical migrants, and he was surprised to learn that the most recent symposium on these birds had been held a decade earlier.

With the increased fragmentation and declining quality of northern forests and the rapidly accelerating destruction of tropical forests during the 1970s and 1980s, songbird research had changed significantly. Basic bird biology studies had given way to more pressing conservation concerns about population and habitat health throughout the Western Hemisphere. Hagan and MBO director Linda Leddy saw that it was time for another symposium to pull together the new, and at times conflicting, research results.

More than 300 scientists convened at the Woods Hole symposium in 1989 to discuss the extent and causes of neotropical migrant declines. The proceedings of this watershed event, edited by Hagan and his colleague, David Johnston, gave rise to several efforts to protect these vulnerable birds, including Partners in Flight—Aves de las Americas (PIF), an international program launched by the National Fish and Wildlife Foundation. By coordinating public and private efforts and disseminating the results, PIF hopes to mitigate past damage and prevent future mass extinctions of neotropical migrants.

Hagan spoke with timber industry representatives at one PIF meeting. He found that they were very interested in participating in bird studies, perhaps as a way to avoid the kind of confrontation over forest use that is taking place in the Pacific Northwest. Hagan saw the advantage of working with timber companies to develop forest management practices that would benefit birds as well as the paper and wood products industry. He was particularly interested in Maine, where the forest is extensive and mostly privately owned.

From this meeting, MBO's Northern Forest Project was born. Hagan would spend three years evaluating the impact of clearcutting and forest fragmentation on birds. His aim at the end of his research was to be able to recommend management strategies that would mitigate adverse effects without compromising the forest's economic and ecological balance, and he would do so as an independent, neutral researcher. Still, the project would be impossible without the cooperation of the timber industry. Three companies—Bowater Incorporated, Scott Paper Company, and Champion International—agreed to provide Hagan with access to their lands. They also lent him their maps, which detail each forest tract's size, tree species composition, and age. Codes printed on the maps, such as H2A, which means "semimature hardwood, well-stocked," or RP89, which means "red pine plantation planted in 1989," serve to define each stand type. "We couldn't have done the study without their maps," Hagan says.

The first step in Hagan's study was to find out which birds were using each forest type and in what population densities. Each night at the beginning of their first field season, Hagan and McKinley would pore over the maps, choosing which plots to sample. By day they would drive miles to check out each stand. "Since the maps were designed for timber inventory, we had to go out as ecologists and relate stand inventory maps to habitat," says McKinley. The mix of hardwood and softwood trees in two timber stands might be much different. Eventually, Hagan and McKinley settled on 192 stands for the initial phase of their study.

Working in pairs, the two and their field assistants conducted 384 point counts, each of which involved standing at a predetermined spot and recording all of the bird species seen or heard during a 10-minute interval. They tallied more

Previous two pages: Maine forest by Helen Longest-Slaughter, Nature Images, Inc.

than 4,000 birds. With timber industry maps in hand and point counts totaled, Hagan's next step was to attempt to estimate bird populations across the Maine landscape.

To facilitate the task, geographic information specialist Amy Meehan transferred an electronic version of the timber industry maps to an MBO computer for analysis. Since the researchers now knew which species preferred to nest in each type of timber stand, they could estimate the abundance of these species by looking at the number of similar stands in the area. But they also needed to take into account what kind of habitat surrounded each stand. Perhaps a hardwood stand surrounded by a clearcut would not be as good for nesting birds as a similar stand surrounded by mature softwoods.

In the second part of the study, the researchers tried to determine whether the birds were breeding successfully. "Point counts tell you what birds are there, but it's possible that few of them are breeding," says Hagan. He chose 11 medium-age or mature-mixed wood stands to study intensively. Though the stands were similar in composition and structure, they differed in their landscape contexts.

Eight of the plots were part of a chopped-up, heavily cut landscape, while the three others were larger and part of a less-managed, continuous forest. Through nest searching and spot mapping (recording each bird seen or heard within a given survey grid), Hagan sought to measure nesting success. He and his team worked closely with researchers from the U.S. Forest Service, led by Matthew Vander Haegen, who were conducting studies to determine whether birds expend more energy in fragmented tree stands than in continuous forest.

The night before my field excursion, I surveyed the broad expanse of green stretching for miles outside the window of my country inn, lulled into believing that I was seeing countless acres of untouched forest. The low roar of trailer trucks hauling loads of neatly stacked lumber at 5:00 A.M. the next morning was my first reminder that I was in timberland.

While driving to one of the study plots at daybreak, we pulled off the paved, tree-lined highway onto one of the many timber roads cut into the forest. I spent several hours following McKinley as he searched for bird nests. Using the grid maps, we moved from flagged tree to flagged tree within the 25-meter grid cells. McKinley pointed out previously discovered nests—hermit thrush bowls buried in leaf litter; tiny warbler cups nestled in the crooks of thin trees. Many of the nests had already failed because of a spate of cold, rainy days and depredations by red squirrels and other nest predators.

McKinley also pointed to spots where the team was conducting vegetation surveys. "We have a lot of information about birds—presence and absence, and nestling success," he says. "In order to complete the picture, we wanted to go in and describe as best we could where all of this was taking place." The researchers recorded the tree and shrub composition, size, and density. They also sampled the leaf litter to complete the physical portrait of the land.

I spent the second half of the day riding with Hagan, who took me on a tour of the timberlands. As we followed the dirt roads wending through the landscape, he pointed out the various patches of forest that make up the Maine mosaic. I could now see that my "sea of green" was a mirage. We saw healthy stands entering their fifth decade of regrowth, medium-aged forests 20 or 30 years old, forests cut only a decade ago, and scarred land that had been clearcut more recently. We drove deep into one clearcut that stretched for miles, its savannah-like barrenness interrupted here and there by a rotting stump or a spindly seed tree, sometimes topped with a watchful kestrel.

This extensive clearcut was completed before the enactment of the Maine Forest Practices Act in 1991. One purpose of this legislation was to prevent timber companies from creating more of these large, ugly blotches on the Maine landscape. The act limited clearcuts to a maximum of 250 acres, prescribed the dimensions of wooded buffer zones along streams and clearcuts, and required timber companies to develop management plans for regenerating clearcuts of more than 50 acres—all to meet its mandate of promoting a

WAYNE LANKINEN

Timber companies and conservationists must learn to work together if we are to save nesting habitat for yellow warblers, above, and other neotropical migrants.

MARK HAYES

Large clearcuts like the one at far right are unsightly, but in the long run they may be better for woodland birds such as the pine warbler, above, than numerous smaller areas connected by logging roads—provided that they are allowed to mature into large, continuous forests again.

"healthy and sustainable forest in the State of Maine." Ironically, the act may be having the opposite effect.

"The Forest Practices Act could not have been better designed to fragment what remains of Maine's continuous tracts of forest," says Hagan. And forest fragmentation is one of the most-cited reasons for the decline of neotropical migrants in the north. "The more you chop up the landscape, the more difficult it may be for birds to disperse to other suitable habitats if they have to cross these barriers of unsuitable habitats," he says. This may be especially true for fledglings. Fragmentation can also increase the rate of predation. "The Forest Practices Act will exacerbate the fragmentation problem because companies have to range farther afield to harvest required volumes of timber, building more roads and creating far more edge habitat than would have been necessary," says Hagan.

But excessive fragmentation isn't the only threat to the Maine Woods. Many people were shocked when Sir James Goldsmith acquired Diamond International through a hostile takeover in the 1980s and sold off precious timberland to developers. What if other financially pressed timber companies follow suit? Could Maine become just one more choked, suburban landscape? Though most of Maine's forest is privately owned, it sustains local economies, provides recreation, and shelters wildlife—very public concerns. And, ironically, the forest's usefulness as a source of timber products is the main factor that has preserved it from developers.

In many ways the variety of successional habitats that timber companies have created within the Maine Woods is beneficial for certain species. Hagan explains, "Once a clearcut gets to be five to twenty years old, with the trees six to twenty feet tall, it is full of neotropical migrants—magnolia, Nashville, and Canada warblers, for example." Hagan's early research shows that although most neotropical migrants have their highest population densities in mature hardwood forests, many migrants have their highest densities in early successional habitats. And two neotropical migrants actually have their highest densities in clearcuts: chestnut-sided warbler and common yellowthroat. Luckily, the nemesis of many songbirds, the brown-headed cowbird, is not a problem in the North Woods of Maine; not one of the 4,000 birds counted in the study was a cowbird, though the species can be found in the Greenville area.

"The management challenge ahead may be to maintain unfragmented tracts of mature forest," Hagan says. The idea that it may be better to have large clearcuts rather than scattered, smaller timber harvest areas is shocking to many people. It will be a tough sell to convince the public to support changing the law to permit larger clearcuts. But as Hagan points out, "A big, unsightly clearcut will one day be a nice, big, continuous piece of forest, provided that it is allowed to mature naturally for fifty, sixty, or more years."

As Hagan's studies expand and intensify over the next two years, more answers will be forthcoming about the effects of timber management practices on the population health and breeding success of neotropical migrants and resident birds. "In many ways that I hadn't thought of before, the land is better off being used as timberland than it would be for many other human activities, so long as adequate tracts of mature forest are maintained," says Hagan. "Whether we want to admit it or not, we depend heavily on forest products. Both the timber industry and the birds depend on mature forest for the long term. We need to make sure that everyone concerned understands this."

Meanwhile, within a 24-hour interval, I have come to see the Maine woods from a new perspective. Though I learned that the endless sea of green I pictured does not really exist—wooded buffers along the roadsides hide areas cut many times during two centuries of lumbering—I've also learned that the forest mosaic I now recognize does work for many birds. Big clearcuts seem to be ugly testaments to an environment under attack, but they may play a role in maintaining large tracts of undisturbed forest. As I head south along Route 6, back to the overpopulated, overburdened lands of eastern Massachusetts, I see the forests for the trees more clearly. ■

Laurel Kornhiser is a freelance writer who frequently reports on Manomet Bird Observatory.

For more information on the Northern Forest Project or other MBO programs, write to: Manomet Bird Observatory, P.O. Box 1770, Manomet, Massachusetts 02345.

DAVID RANSAW

Murder Most Fowl

Although both of these brown booby eggs will probably hatch, only one of the downy chicks will survive.

When one nestling causes the death of another, how do their parents benefit?

Text and photographs by John Alcock

The brown booby on the nest in front of me is an elegant creature despite the predominance of browns and whites in her plumage. Her feathers are sleek, her beak substantial, her demeanor calm even though I am standing only a few feet away. Between the female and me is another booby, a tiny, nearly featherless infant crawling weakly forward on the sandy, superheated soil. Much smaller than its sibling, which sits in the shade of its mother's belly and wing, the exposed infant is essentially naked, subject to the full force of the sun and clearly much the worse for it. It lies wilted on the unforgiving ground.

Clacks, hoots, and hisses issue from a nearby nesting adult that has been disturbed by another neighbor, returning to one of the hundreds of booby nests scattered about in the open grassy and sandy

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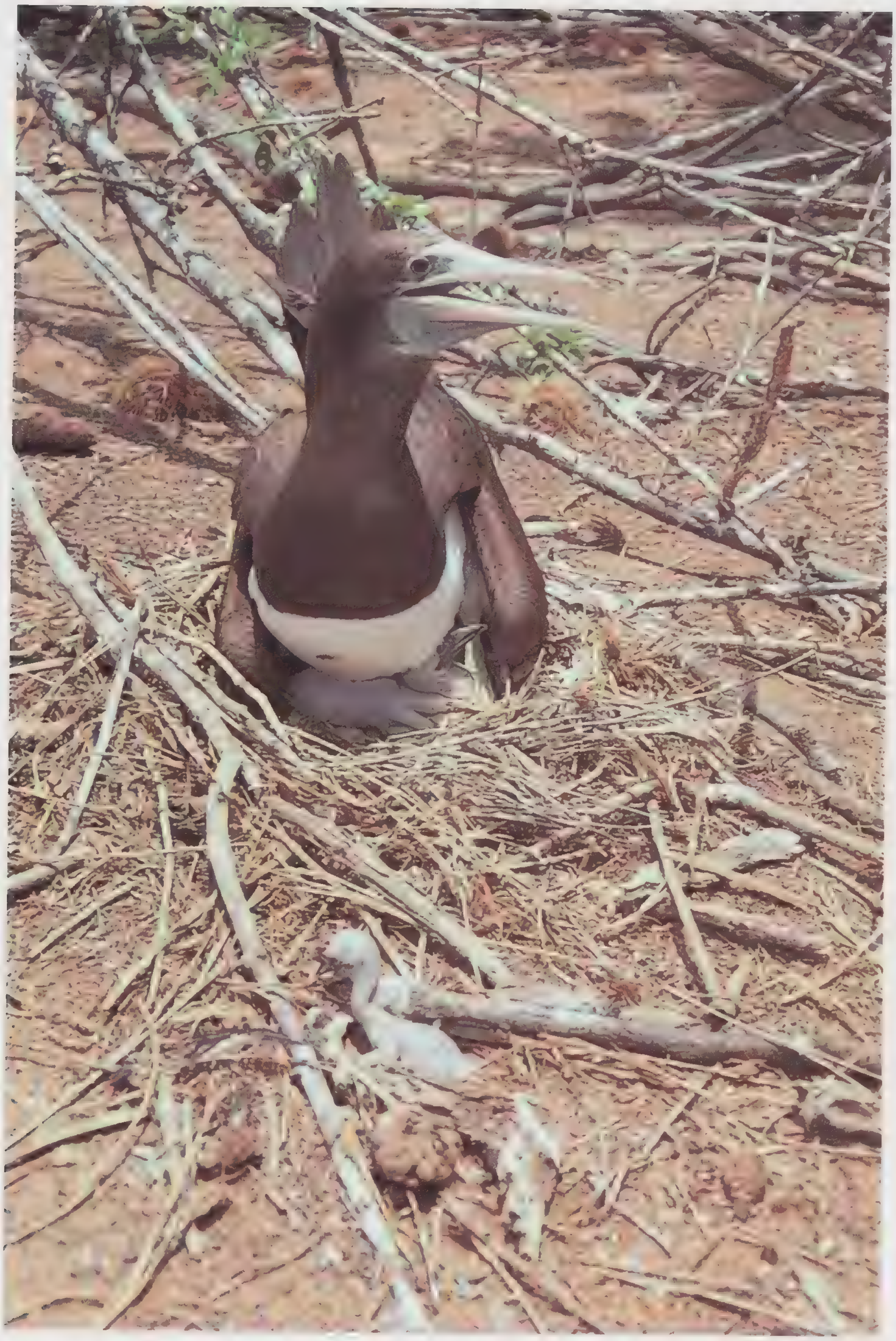

Siblicide in progress: Pushed from the nest by its older, larger sibling, this tiny chick is doomed to die. Meanwhile, its parent watches unconcerned, tenderly shading the big chick from the killing rays of the sun.

areas on the island. A huge cumulus cloud billows up over the electric blue bay lying between Isla Pájarera and mainland Mexico. Riding the thermals, dozens of frigatebirds loop and climb the sky together in effortless spirals until they are so far away that they could be mistaken for barn swallows.

Far below the circling frigatebirds, a brown booby flying with heavy strokes suddenly folds up its wings and turns over to plummet straight down, rocketing into the water like an air-to-sea missile. After a brief immersion, the booby pops out of the water, holding a small fish in its beak. It struggles to become airborne again and then resumes its ponderous flight toward its offspring and nest-guarding partner on the island.

The heat and humidity cast a spell on the earthbound occupants of Isla Pájarera. Breezes streaming off the Pacific Ocean add the odors of the sea and seashore to the pervasive scent of booby guano emanating from the colony. Shade for bird observers is scarce but some relief comes from a grove of giant, columnar cacti, their vertical surfaces streaked with white jets of guano, their many armtips occupied by somnolent boobies and a handful of black vultures, which look considerably more alert than their companions.

But there is no shade for the doomed infant booby. Its mother leans forward to peer at her offspring and then picks up a twig, which she places by the infant's side. The youngster makes another feeble effort to scrabble ahead but then gives up, its head falling to the ground, its thin neck outstretched. The larger, downy chick shifts under its mother to achieve full protection from the sun that has just about killed its sibling. A black vulture watching from its perch overhead will finish the job as soon as I leave.

Far from being an unusual tragedy, this scene is repeated over and over again during the booby's breeding season on Isla Pájarera and elsewhere. Brown boobies typically lay two eggs, but they absolutely never rear two offspring to the age of fledging. At least one of the chicks always dies; the other may be fortunate enough to survive, thanks to the solicitous and skillful parenting it receives from its mother and father, who offer it protection from predators, shade from the sun, and fish from the sea.

Yet although adult boobies are superb parents when dealing with a single chick, they are actually accomplices in the "murder" of their second offspring. Exposure to the sun or to vultures is usually the immediate cause of death for infant boobies that expire within a few days of hatching, but the real killer is actually a sibling that forces the smaller, less-developed brother or sister out of the nest and into the open, away from the vital shade provided by its mother or father. The nest-sheltering parent makes no move to intervene in the brutal eviction of its tiny, nearly helpless offspring. It surveys its surroundings as if nothing of significance were happening during the lopsided contest between nestmates. Only after its baby has been kicked out of the nest does a parent sometimes tuck a twig or two around the dying youngster—but the adult never retrieves the nestling.

This is a strange business, generally disturbing for humans to observe. But it is also a fascinating phenomenon if viewed from the dispassionate perspective of evolutionary theory. The $64,000 question is this: How can it be adaptive for parents to tolerate the siblicide that is committed beneath their very eyes? Here we have a case in which one sibling dispatches another, despite the close genetic relationship between the two, while the par-

At left, a parent with its downy nestling. Brown boobies never rear more than one chick to fledging—there just isn't enough food to go around. So why lay two eggs? The second one serves as a kind of "insurance policy," in case anything happens to egg number one.

ent benignly watches the destruction of an individual that could have carried its genetic heritage into the next generation.

Is this acceptance of an offspring's death a mistake, a reflection of the sheer stupidity of boobies, which have never been accused of exceptional intellect? Surely if a hereditarily different kind of parent were to arise through mutation, one that did not passively accept the demise of its offspring, that kind of booby would propagate its special genes more effectively than the kind now occupying Isla Pájarera.

But maybe not. Let's assume that siblicide in brown boobies is not a pathology but instead an adaptation (admittedly a gruesome one) that has spread through the species by natural selection. Working from this assumption, some ornithologists have begun to test ideas on how acceptance of siblicide might, paradoxically, be the best way for an adult booby to pass on its genes.

The idea that parents might gain from siblicide has some plausibility given that they not only permit one youngster to evict another from the nest, they actually promote siblicide by incubating the eggs as soon as they are laid. Egg number one, which is produced a few days before egg number two, hatches sooner, giving the firstborn a head start over the hapless second chick. When this boobylet enters the world, the much-larger senior nestling can easily force it out of the nest. A chick could not dispose of its nestmate with so little effort if its parent had simply waited until both eggs were laid before beginning continuous incubation—a practice that is followed by a host of other birds.

It may be advantageous for brown boobies to incubate their eggs in ways that create chicks of unequal sizes, if the inequality helps to remove a supernumerary offspring that the parents could not have reared successfully, no matter how hard they tried. If food is scarce, brown boobies that attempt to fledge two offspring in one breeding cycle might well wind up with two dead chicks, or chicks so stunted that they might never live to reproduce. Having a good chance of fledging one healthy, well-fed chick is better than gambling on rearing two chicks, only to fail. Offspring that fail to reproduce fail to carry on the genetic basis for the "strategy" that was employed by their parents.

But if the food supply isn't sufficient for two chicks, why bother laying two eggs? An egg costs a mother booby something to make. Wouldn't she be better off conserving the resources that went into the second egg and putting her all into a single egg?

Maybe not. If there is a chance that one egg will fail to hatch, or that the first-born chick will be defective in some way, laying a second egg could serve as a reproductive "insurance policy" for the two-egg mother. Imagine that the first egg yields a chick that gets injured early in life. The second chick will have a chance to surpass its sibling in size, at which time it can push its rival out of the nest, leaving its parent with one sound offspring. In this case, the junior chick may repay its parents by surviving to perpetuate their genes.

How can we test the insurance egg hypothesis? If it is correct, then we should find that parents do sometimes care for the junior chick because of some defect in the first-laid egg or the first-born offspring. Studies of the brown booby indicate that the second egg produces the sole surviving offspring in two-egg clutches about 17 percent of the time. Thus, during one breeding cycle in six, two-egg parents produce an offspring when single-egg parents would not have.

The same result applies to the masked booby, a closely related bird, where the second egg yields the surviving offspring in about one nest in five. Like brown boobies, masked boobies never raise two chicks to the age of fledging because the larger, healthier chick always disposes of its sibling early in the nesting cycle.

But not all boobies go the brood-reduction route from two eggs to one nestling via the tender mercies of siblicide. Five species in the genus *Sula* lay a single egg, which gives parents just one chance to produce an offspring per nesting attempt. If egg insurance is such a good policy for brown and masked boobies, why not for gannets and red-footed boobies too?

David Anderson, now at the University of California at Davis, considered two hypotheses as to why there might be single-egg and two-egg species of *Sula*. One possibility was that the cost of producing a second egg might be substantially greater for the single-egg species. But Anderson dismissed this explanation when he discovered that the

Siblicide is a "sometime thing" in great egrets. When food is abundant, parents can raise three or even four chicks; when food is scarce, larger chicks toss the smallest one out of the nest. Below, two chicks fight as a parent looks on.

BRUCE LYON

volume of booby eggs is a nearly constant (and very small) proportion of the body mass of egg-laying females. Single-egg species do not invest much more in an egg than do two-egg species.

The alternative hypothesis was that the value of a second egg is greater for the two-egg species than for their one-egg relatives. The evidence supports this prediction: one-egg boobies have much higher egg-hatching success (ranging from 85 to 98 percent) than brown and masked boobies (whose first-laid eggs have only a 50 to 60 percent chance of hatching).

Anderson is not sure why the two groups of boobies show such a big difference in egg viability, but he notes that brown and masked boobies nest on the ground on tropical islands, where temperatures reach extremely high levels. The single-egg species are either temperate zone species or, if they breed in the tropics, nest in trees; thus their eggs are not subject to the same risk of overheating as those laid on the ground in places like Isla Pájarera. I find Anderson's speculations plausible, having come close to sunstroke myself while I watched adult brown boobies on sun-baked Isla Pájarera, their gular pouches fluttering continually in an attempt to stay cool as they shaded their precious eggs.

Siblicide in brown boobies may have evolved because parents benefit by laying a second egg as insurance against the first egg getting cooked during incubation. But if you lay two eggs, sometimes both will hatch. If raising two fledglings is out of the question, something has to be done to remove one of the two hatchlings—and in brown boobies, obligatory siblicide does the trick.

We can explore this explanation further by looking at siblicide in other birds, because the phenomenon is not limited to brown and masked boobies. For example, the great egret is a species in which siblicide frequently occurs, as Douglas Mock and his associates at the University of Oklahoma have shown. Their observations reveal some similarities and some important differences between great egrets and brown boobies in their practice of siblicide.

A great egret parent, like a brown booby, begins incubation as soon as the first egg is laid so that hatching is staggered, creating size mismatches among the three or four offspring. As is true for brown boobies, senior chicks abuse junior ones and may be directly responsible for their deaths, usually by evicting them from the nest. Parent egrets make no move to interfere. By permitting healthy senior offspring to dispose of weaker junior offspring, adult egrets invest their limited parental resources in young that have the best chance of reaching reproductive age.

But whereas in brown boobies the death of one chick is as certain as taxes, siblicide is a sometime thing in great egrets. Under the right conditions, parents can raise all three or (exceptionally) four of the chicks they produce in a breeding season, despite the fighting that goes on among siblings. If food is unusually abundant, parents will be able to satisfy the demands of the first- and second-hatched chicks and still have some left for the junior chick. The smallest offspring may be able to hang in there, even though it will have to endure a great deal of bullying from its senior siblings.

> *By making it easy for certain of their offspring to destroy their brothers or sisters, the parents save time and energy*

In cases like this one, the insurance egg hypothesis doesn't seem to fully explain a female's readiness to lay more eggs than she and her mate can *usually* rear. True, a first-laid egg sometimes fails to hatch or produces a defective senior chick, in which case the existence of an expendable third or fourth egg enables the parent to have a replacement in hand. But Mock has shown that these "extra" eggs also have the potential to become surviving offspring, should the fishing be exceptional for their food-gathering parents. In three-egg nests with surviving senior chicks, the youngest egret chick survives the nestling phase about 15 percent of the time, providing added reproductive success for the parents (to the extent that these chicks can make it to reproductive age themselves).

Thus siblicide is optional in great egrets, obligatory in brown boobies. But in either case, parents of the practitioners of siblicide benefit because the behavior removes offspring they have little or no chance of rearing successfully. By making it easy for certain of their offspring to destroy their brothers or sisters, great egret and brown booby parents save time and energy that they can devote to their successfully siblicidal progeny. As a result, these youngsters may live long enough to become nesting adults—staring vacantly at their surroundings, while in the nest beneath them a new generation of offspring endowed with the genes for siblicide exercise their heritage and perpetuate a grim but adaptive practice into the future. ■

John Alcock is a professor of zoology at Arizona State University. He is currently on sabbatical leave in Australia, where he is adding substantially to his life list of Australian birds seen and admired.

Further Reading

Anderson, D. J. "Evolution of obligate siblicide in boobies. 1. A test of the insurance-egg hypothesis." *American Naturalist* 135: 334-350; 1990.

Mock, D.W., H. Drummond, and C.H. Stinson. "Avian siblicide." *American Scientist* 78: 438-449; 1990.

Right: Mary Stibritz. Far right: Helen Longest-Slaughter, Nature Images, Inc.

AN IMPERFECT DEFENSE

Lubber grasshoppers keep most predators at bay with poison secretions, but loggerhead shrikes have found their weakness

by Reuven Yosef and Douglas Whitman

Early one morning in the summer of 1990, I was walking at the edge of a field in south-central Florida when I noticed a macabre scene: a large, brightly colored grasshopper impaled on a barbed-wire fence. The insect was still alive, even though the metal barb penetrated its thorax. Writhing and twisting, the dying grasshopper grasped at the air and flicked its stubby red and black wings in a futile attempt to free itself.

I knew that the grasshopper on the wire signaled the territory of a loggerhead shrike. Shrikes are active predators with characteristic, if somewhat morbid, behavior: they impale their prey on thorns, short twigs, or barbed wire. The birds later return to this cache to consume the impaled prey.

Looking down the fence line, I noticed more proof of this shrike's hunting prowess: a large collection of insects, frogs, small lizards, and more of the colorful grasshoppers decorated the strands of barbed wire. Beneath the fence lay the remains of previous shrike meals, and I noticed with surprise that the shrike had eaten only the grasshoppers' heads and abdomens, discarding the wings, legs, and thoraxes. The garbage heap sparked my curiosity, because with grasshoppers, shrikes usually consume the thorax, too. I collected a few of the grasshoppers to take back to the Archbold Biological Station, where at the time I was a post-doctoral student.

Mark Deyrup, the entomologist at Archbold, was excited by my find. He identified the insect as a lubber grasshopper, a species that employs a chemical defense to protect itself from predators. Mark suggested that I contact Douglas Whitman, a chemical ecologist at Illinois State University, to find out more about the species.

Doug had studied lubbers for almost a decade. He, too, was excited about my discovery. He had originally assumed that these large, flightless grasshoppers would be easy prey for birds. Lubbers by the hundreds often congregate together, offering what would seem to be a slow-moving feast. But during field observations in Georgia and Florida, Doug watched more than 100 insectivorous birds of 17 species forage in or near groups of lubbers and saw only one bird attack the grasshoppers.

Later, in laboratory experiments, he offered lubber grasshoppers to 119 individual birds and lizards representing 21 species. He found that in all but one case, birds rejected the grasshoppers either before or soon after sampling one. The birds and lizards that did consume lubbers often vomited, providing evidence that lubbers contain potent toxins.

Like many insects with chemical defenses, lubbers advertise their distastefulness to potential predators. They combine bright, warning colors with a volatile, pungent secretion that they squirt out with a hissing noise when a predator approaches. This secretion, stored in glands in the thorax, is a mixture of bitter-tasting chemicals, some of which the lubbers obtain from the plants they eat. A bird doesn't have to actually swallow a lubber to learn that the insect is toxic—the foul taste and smell of the secretion are enough to deter most birds.

Bright colors warn that this lubber grasshopper is a toxic mouthful. One species—the loggerhead shrike, left—has overcome the chemical defense.

Given that lubber grasshoppers are clearly poisonous, and given that they advertise this danger with bright colors, loud noises, and a foul-smelling defensive spray, I wondered why the loggerhead shrikes around Archbold Biological Station were catching and impal-

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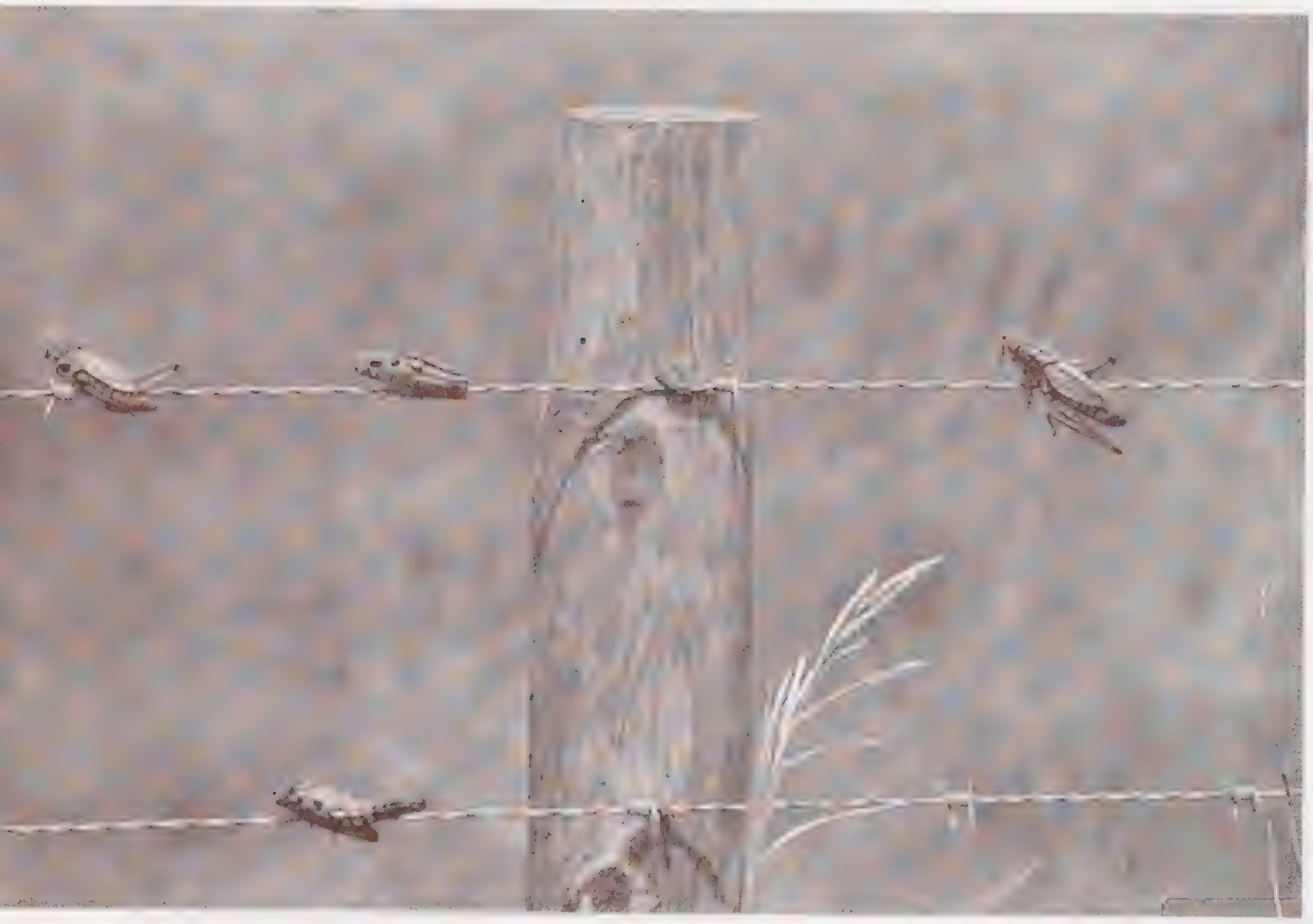
ing so many of them. Several possible explanations for this behavior came to mind. First, perhaps shrikes don't discriminate when they capture and impale grasshoppers (the "cache first, ask questions later" approach). Or perhaps shrike digestive tracts have somehow evolved the ability to cope with lubber toxins.

I also considered the possibility that shrikes impale the brightly colored lubbers, not to eat them, but to communicate with other shrikes. In my past research on northern shrikes in Israel I had found that males added inedible but conspicuous materials such as ribbons, paper, feathers, and crusts of bread to their caches during the breeding season. The males with the biggest, showiest caches were the first to attract mates. So perhaps these loggerhead shrikes were impaling the showy lubbers for display purposes only.



REUVEN YOSEF

Above, lubbers on a line: Shrikes impale their prey on thorns, sticks, or nowadays, barbed wire. This habit of storing food allows shrikes to eat the poisonous grasshoppers; aged a few days, the insects are harmless.

Doug and I decided to test whether loggerhead shrikes could actually consume live lubber grasshoppers. We trapped 10 young birds and placed them in individual cages, each fitted with a strand of barbed wire. After an acclimation period, we offered each bird five live adult lubbers and watched from a blind to see how the birds reacted.

Three of the shrikes refused to attack. These birds seemed agitated, flying back and forth across their cages while eyeing the grasshoppers. The other seven shrikes quickly attacked the lubbers, seized them, manipulated them into a head-first position, and tried to swallow.

Meanwhile, the grasshoppers were fighting back. When the birds attacked, the lubbers fired their defensive spray, regurgitated, kicked, and flicked their brightly colored hind wings. The unhappy shrikes responded with avoidance behaviors; they dropped their prey, gagged, stuck out their tongues, drooled, squawked, and shook their heads back and forth. After a few minutes, however, they resumed their normal behavior. All of the grasshoppers survived the experience. On subsequent days, when I offered lubbers, the young birds inspected them but didn't attack.

These results didn't make sense. We knew that wild birds were impaling lubbers in the field, but young birds refused to do so in the lab. We wondered whether older, more experienced birds had some strategy for overcoming the grasshoppers' defenses.

We decided to test 10 adult shrikes in a similar experiment. When we put lubbers in the birds' cages, 6 of the 10 refused to attack, but the other 4 birds seized and impaled all 5 grasshoppers. In the wild, a hungry shrike that has caught a palatable grasshopper usually bites its prey at the thorax and crushes it, pulls off the legs, wings, and antennae, and swallows the morsel headfirst. The experimental birds behaved differently: they grasped the lubbers and immediately impaled them without removing their appendages. During this experiment the lubbers let loose their defensive spray and some birds reacted with avoidance behaviors. Each of the four birds continued attacking, however, until all five grasshoppers were impaled.

We left the impaled grasshoppers in the cages. After a day or two, when the lubbers had changed color from bright yellow to brown, the birds ate them—but only the heads and abdomens. They rejected the legs, wings, and thoraxes, just as I had observed in the field.

It seemed that although the thoraxes with their poison glands were still inedible, portions of the dead lubbers had become less distasteful with time—as their color faded, so did the level of toxicity. I decided to test this possibility.

I selected six shrikes that had aggressively attacked grasshoppers in earlier experiments and offered each of them six previously frozen lubbers. Three of the six grasshoppers had been thawed two days earlier and held at room temperature; their color had changed from yellow to brown. The other three grasshoppers had been thawed just two hours prior to the test and were still brightly colored. All of the shrikes impaled all of the grasshoppers, then ate the brown ones right away. The birds left the "fresh" grasshoppers to age for two or three days.

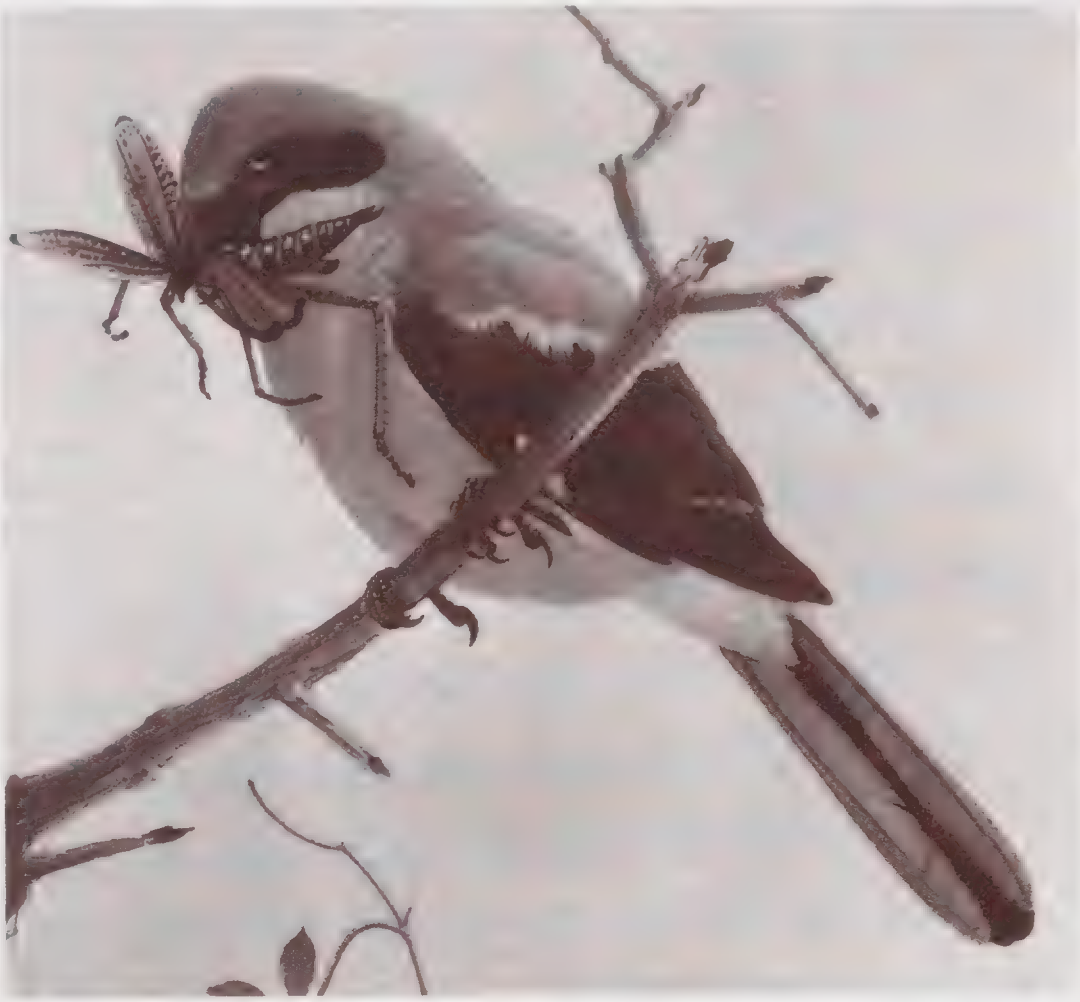
What do these results mean? Apparently, lubber toxins degrade after the insect dies. This posthumous "Achilles' heel" has allowed shrikes to overcome the lubber's defenses. Like other birds, shrikes can't feed on fresh lubbers. But their caching habit has pre-adapted them to exploit a hefty and abundant food source, one that most other predators won't touch. A behavior that served one purpose has become advantageous in a new way.

Shrikes are found throughout much of the world, and all 30 species impale their prey. Impaling behavior probably evolved as a way to handle prey—shrikes lack the strong talons that raptors use to grip their catch, so a handy thorn, forked stick, or nowadays, barbed wire, serves this purpose. Over time impaling behavior came to serve other functions—it allowed shrikes to store food and to broadcast their appeal as potential mates. My research on northern shrikes in Israel demonstrated that the males with the biggest caches found mates soonest, and also raised the most offspring. Perhaps loggerhead shrikes in Florida initially impaled the colorful lubbers because they made good displays and only later discovered that aged lubbers were edible.

Caching may have opened up a whole new feeding niche for shrikes. During field studies we saw shrikes impaling other chemically defended organisms such as monarch butterflies and the eastern narrow-mouthed toad. Perhaps, like lubbers, these toxic prey become palatable with time. By broadening their feeding niche to include chemically defended prey, shrikes can take advantage of food items that are conspicuous, easy to catch, and often abundant.

The relationship between shrikes and lubbers parallels that between monarch butterflies and their predators. Both monarchs and lubbers are large, brightly colored, and gather in conspicuous groups. Monarchs were once thought to have no predators, but we now know that some birds can break through their defenses. Black-backed orioles sample monarchs and eat the ones with low levels of toxins. Black-headed grosbeaks are apparently insensitive to monarch toxins. Together these two species eat hundreds of thousands of monarchs each year.

The lubber grasshopper illustrates how traits may be acted upon by competing selective forces. Grasshoppers tend to be cryptic, wary, active, and quick to take flight on powerful wings. Lubbers lost these traits because their potent toxins and attendant warning displays were so efficient in deterring predators that other defense mechanisms were unnecessary. Now lubber traits that were once adaptive—bright, conspicuous colors, large body size, and gregarious habits—may be a liability. In areas where shrikes and lubbers coexist, the birds may be exerting a counterselective force against these traits. Eventually, the lubbers in these areas might become smaller, drabber, and more agile—or they might evolve more powerful chemical defenses.


DIANE PIERCE

"That's impossible!" ornithologists scoffed when wildlife artist Diane Pierce depicted a loggerhead shrike eating a lubber grasshopper, above. But the scientists have since been proven wrong.

In a broader sense, our study supports the idea that no defense is perfect. For every defense there is at least one predator that will be able to overcome it. Although lubbers are safe from most birds, one species, the loggerhead shrike, has developed the ability to successfully prey upon it.

As an interesting footnote, although scientists became aware of the lubber-shrike relationship only recently, at least one amateur naturalist has known about it for some time. Almost 10 years ago Diane Pierce, a Florida wildlife artist, made a drawing of a loggerhead shrike feeding on a lubber. Her illustration drew critical remarks from many scientists (especially ornithologists), who told her that the behavior she had depicted was impossible. Ironically, the amateur naturalist was right. The moral of the story? Trust your observations, even if they fly in the face of current dogma. ■

Reuven Yosef is director of the International Ornithological Center in Elat, Israel.

Douglas Whitman is an assistant professor at Illinois State University, where he studies the chemicals that influence plants, animals, and their natural enemies.

MY WAY TO ORNITHOLOGY

BY OLIN SEWALL PETTINGILL, JR.

Norman, Oklahoma: University of Oklahoma Press, 1992. 246 pages. $24.95 (cloth)

Today, the pathway to becoming a professional ornithologist is well traveled. Most aspiring ornithologists start out as birders, become more sophisticated during an undergraduate education in the biological sciences, take advantage of the hundreds of graduate-school opportunities that offer advanced degrees, and finally apply for one of the thousands of career-level jobs in academia, government, or the private sector. The path was not always so straightforward, and Olin Sewall Pettingill, Jr., has given us an engaging account of his way to ornithology when the goal of a career in this field was still a novelty.

After describing his supportive family and circle of friends, Pettingill devotes the core of the book to his academic life and field experiences in the 1920s and 1930s. As an undergraduate at Bowdoin College in his native Maine, Pettingill took every opportunity to become engaged in field ornithology, frequently accompanied on adventures by his future wife, Eleanor. While at Bowdoin, he became fascinated with the American woodcock and bird photography, and he published his first major article: "The Passing of the Heath Hen." The stage was set for the next pivotal step, which took Pettingill to Cornell University to study with Arthur A. Allen.

At the time, Cornell was one of the few schools that offered graduate study in ornithology. Pettingill had the good fortune of attending Cornell at the same time as famed artist/ornithologist George Miksch Sutton. They roomed together in the home of Louis Agassiz Fuertes's widow and eventually became lifelong friends and colleagues. The American woodcock, of which he had grown so fond, became the topic of Pettingill's Ph.D. thesis, which still stands as a major contribution to our knowledge of this fascinating bird.

Ultimately, Pettingill found his way back to Cornell after teaching at Bowdoin, Westbrook, and Carleton, and establishing a reputation as a lecturer, photographer, and author. He became director of the newly-built Laboratory of Ornithology in 1960 and played a central role in shaping the character of Arthur Allen's dream.

My way to ornithology crossed paths with Pettingill's between 1964 and 1973, while I was a student at the Lab. I studied his time-tested textbook, *Ornithology in Laboratory and Field*, in my own quest to become a professional ornithologist. His autobiography closes before his 13 years as Lab director begins, which left me wishing that he had provided details of these culminating years in his distinguished career. Still, after reading about his graduate student years at Cornell, I felt a greater kinship with him than I had before. Despite the 40 years that separated us, our ways to ornithology were, in the end, quite similar. I suspect that other ornithologists, amateur and professional, will enjoy this well-told

RICHARD FRANK

Former Lab director Olin Sewall Pettingill, Jr., above, is now retired and lives in his native state, Maine.

life story and find parallels to their own experiences.

—*Stanley A. Temple*

1993 TOYOTA LANDCRUISER

You may remember that last year *Living Bird* published its first vehicle review—an evaluation of the Ford Explorer that the Lab's big-day birding team, the Sapsuckers, drove in the 1992 World Series of Birding. This year the team took a brand new Toyota Landcruiser to New Jersey and put it to the ultimate test.

Any of you who have followed the trials and tribulations of the Sapsuckers during the last decade of Big Birdwatch competitions know how grueling these events can be for vehicles (and team members). But the 24 hours of constant, high-speed birding that participants endure on the actual big day are only the tip of the iceberg. This year we spent 10 days before the World Series scouting the entire state of New Jersey—sleeping three hours a night in flea-bag motels; driving hundreds of miles a day across all kinds of terrain.

TIM GALLAGHER

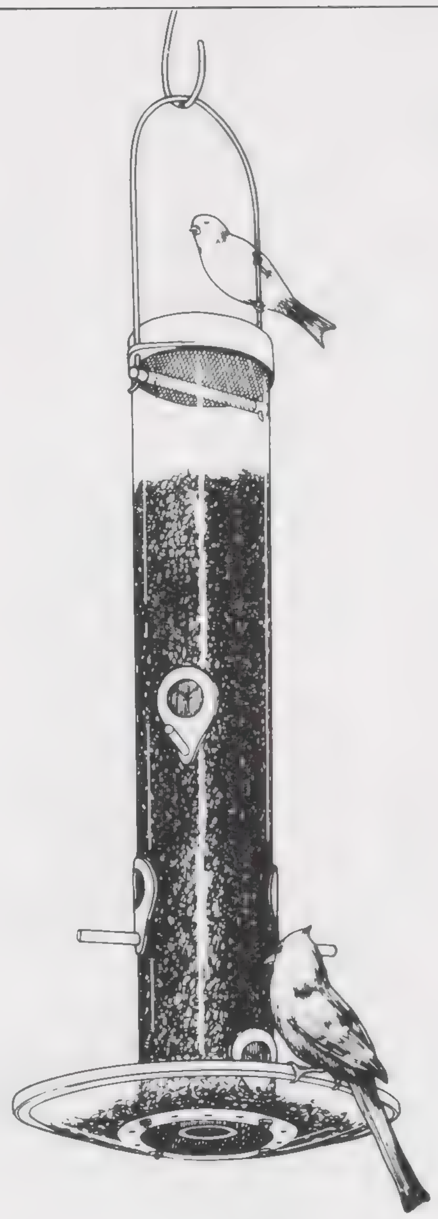
When you have to live in a vehicle 16 hours or more a day for that long of a period, you need it to be comfortable, rugged, and dependable. The Landcruiser came through on all counts. It had virtually everything we could want: a 4.5-liter, 24-valve, six-cylinder engine; four-wheel drive; anti-lock brakes; alloy wheels sporting 16-inch Bridgestone off-road tires; power moon roof; gray leather interior; a deluxe sound system with six speakers; air conditioning; and power *everything*. The Landcruiser came equipped to transport eight adults—anywhere. The rear seats could fold up and out of the way to create additional cargo room. But since our team consisted of only five birders, we removed the last row of seats to make room for our spotting scopes and a stack of submarine sandwiches.

The Landcruiser had a remarkably smooth, quiet ride for a four-wheel-drive vehicle. Its height above the ground, boosted even more by the oversized tires, gave us an excellent view of our surroundings, enabling us to peer over obscuring brush to see birds. On the down side, it also raised the vehicle's center of gravity, which might make sudden turns at highway speed potentially hazardous. In addition, the ride was a little bouncy on rough roads because of the off-road tires and the heavy-duty suspension—but this is acceptable if you truly need off-road capability.

During our pre-big-day scouting, I had a chance to try out the Landcruiser's excellent sound system. I slipped a compact disc recording of Eastern bird songs into the CD player as the other Sapsucker team members were searching a nearby forest stand for warblers. The dry trill of a male worm-eating warbler ringing out from the speakers brought the team scurrying toward me, hoping to see a species we had not found yet. And no one knew if it was Memorex or the real thing.

The Landcruiser we tested had all-time four-wheel drive, which is convenient but makes this creature very thirsty at the gas pump—estimated highway fuel mileage is only 15 miles per gallon. I'd prefer to have on-command four-wheel drive and better fuel economy. Another annoying feature for big-day birders is the darkly tinted glass of the side windows, which makes it harder to spot birds. But I'm getting pretty picky. If you need a comfortable vehicle that can take you and seven companions anywhere (and if the $39,640 price tag doesn't scare you away), the Toyota Landcruiser would be hard to beat.

— *Todd Culver*



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Is "Ecotourism" an Oxymoron In Costa Rica?

Chris Wille writes in the Summer issue of *The Living Bird* (Vol 12, No 3) that in 1992 "more than 49,000 ecotourists breathed the mists of Monteverde's trails." What he didn't say was that most came off of cruise ships just to visit a cloud forest and perhaps, if lucky, see a Quetzal. A what?

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The tour, which includes a visit with **Dr. Alexander Skutch**, has been designed by **Julio Sanchez**, Professor of Ornithology and Curator of the Museum at the National University in Costa Rica. (see Chris's article in *American Birds*, Spring 1993, Vol 47, No 1). Sanchez leads our January trip (15 - 29, 1994) and is joined by **Richard ffrench**, MBE, author of *A Guide to the Birds of Trinidad & Tobago*, in March (March 27 - April 10, 1994).

We know birders are good ecotourists - it's the bananas we worry about.

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My Turn

DON'T MAKE BIRDING A TRIVIAL PURSUIT

by Bob Marcotte

Item: *Birders flock to Amherst Island, Ontario, to view winter owls. Unfortunately, some of the birders trespass, break limbs to get better pictures, use camera flashes at close range, and even grab owls for hand-held shots. Local naturalists and landowners are infuriated. They urge birders to stay away.*

Item: *When a national birding organization surveys its members, nearly half of the respondents say that they would knowingly trespass on federal land to add the endangered Kirtland's warbler to their life list, even though the property—the species's only remaining breeding area—is strictly off limits to minimize disruption.*

Item: *Birders harass the first eared trogons ever known to have nested in the United States by running up and down Arizona's Ramsey Canyon, shouting to each other, playing taped calls at full volume, and leaving the trails to chase the birds. The harried trogons move from the area. When they return weeks later to resume nesting, it is late in the season and the offspring don't survive.*

ANNE & FRANK KLUG

Would you trespass on federal land to add the endangered Kirtland's warbler to your list?

Wait a minute, fellow birders. Have we turned birding into a trivial pursuit? Is the primary objective to add to one's life list, state list, month list, day list, or hour list—and damn the cost? Has birding become a carnival freak show in which the only bird worth observing is the bizarre rarity or the vagrant thousands of miles from its normal range?

Don't get me wrong. I enjoy a good find as much as any birder. The fork-tailed flycatcher that my wife and I spotted in Hamlin, New York, was not only a first for our area, but a highlight of my birding career. I have nothing against keeping lists, and I recognize the value of finding and observing as many species as possible.

But I wouldn't drive much more than 30 or 40 miles out of my way to see a rare bird somebody else had found and documented. I wouldn't trespass or damage habitat. And if the bird were nesting, I would try my hardest not to disturb it—even if that meant not seeing the bird.

After all, once a rare bird has been discovered and documented, progressively less and less purpose is served if another 50, 500, or 5,000 birders come to see it. Isn't it a bit presumptuous to think that adding species number 400, or even number 700, to a personal life list is so important in the grand scheme of things? Do we really think that our lists will be carved in stone somewhere and treasured for posterity? Especially when so many other birders already have lists just as long and just as impressive?

Apparently many birders do not share that view. Small wonder. Freak sightings and mammoth life lists seem to be the predominant way of earning the esteem—and envy—of one's birding colleagues. Just look at our birding publications, especially the ones that list what's been seen and where. The main emphasis is placed on the bizarre and unexpected—on the birds that weren't supposed to be there.

But what's happening to the more commonplace birds that should be there? That, I submit, is the crucial issue that we should confront.

We all bemoan the decline of neotropical migrants. We argue for habitat preservation. But without hard data, those arguments fall on deaf ears. Yet how many of the birders who travel hundreds of miles to see a rarity are willing to devote equal energy to breeding bird surveys and studies of our more commonplace but declining songbirds? Are birding organizations doing all they can to enlist part-time amateur birders in meaningful projects—projects that might help us to understand what is happening to all our birds as habitat disappears?

This past spring, for example, I participated in a Nature Conservancy study aimed at identifying and preserving key migration stopover points along the south shore of Lake Ontario. It meant spending some mornings in areas that weren't as exciting as my favorite spots—but I was more than happy to do it.

I don't want birders to stop celebrating the rare and the unusual. But we should strike a balance. We should respect the needs of birds—and the rights of people. We should find more meaningful things to do than simply adding species to our personal life lists. We should stop fiddling while Rome burns. In the end, it will benefit all of our birds—the rare, the bizarre, and the commonplace species. ■

Bob Marcotte lives in Rochester, New York.

Take your turn. Submit your comments on birding issues to: My Turn, *Living Bird*, 159 Sapsucker Woods Road, Ithaca, New York 14850.

and ledges of these structure. This habit facilitated their eventual domestication some 6,000 years ago in the Middle East.

As Europeans spread to the Americas, Australia, New Zealand, and other lands where this particular species was not present, they carried domestic pigeons with them to use as message carri-

they build it together, exhibiting a division of labor widespread in this family. The female sits on the growing structure while her partner gathers nest material. Depending on the species, the male may break twigs from high in trees or gather straws and weed stems from the ground. If a piece breaks when he shakes it, he drops it and seeks another.

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Feral pigeons, regarded by many as feathered pariahs, are usually neglected by serious bird watchers. The birds have been studied most intensively by people hired to find ways to reduce troublesome urban pigeon populations. To learn how they nest and rear families, we must turn to studies of wild Rock Doves or domestic pigeons, or even to pigeons and doves of different species and genera. We can do this with confidence because the breeding habits of practically all members of the pigeon family are basically similar.

Pigeons are monogamous. Mates are strongly attached, resting close together, caressing and preening one another, with the male often regurgitating food for his consort. He guards her closely, driving away other males that approach her. After the pair has chosen a site for their nest,

abruptly whitish at the tip. A hard, whitish egg tooth at the tip of the upper mandible, and a similar but smaller one at the end of the lower mandible, help the chick to break out of its shell. The parents carry away the empty shells, usually half at a time, unless the two parts hang together.

As hatching time approaches, both parents undergo physical changes that enable them to feed their progeny. The walls of the crop, a saclike expansion of the esophagus, thicken until its weight is increased threefold. Special cells lining the crop swell with proteins and globules of fat, then slough off, producing crop milk. Composed of 13 to 19 percent protein, 7 to 13 percent fat, 1 or 2 percent mineral matter, vitamins A, B, and B_2, and 65 to 81 percent water, pigeon milk is highly nutritious, but lacks the sugar and other

WAYNE LANKINEN

Now listed as a single species, the red crossbill may be several look-alike species.

animals to extract the seeds easily, and most of the seeds are still in the cones during the late winter and early spring, when the crossbills need them most. In the western United States, Benkman identified Douglas fir, ponderosa pine, western hemlock, lodgepole pine, and Sitka spruce as likely "key conifers."

Benkman captured crossbills belonging to four different call types and observed their foraging behavior in an aviary. He discovered that each type was most efficient at foraging on the cones of a particular species of conifer. Independently, he also measured the birds' bill sizes and palate structures and used the information to predict which conifer species each crossbill type was optimally adapted to feed on. He found an almost perfect match between his predictions and the species of conifer each type preferred.

Exactly how the ancestral red crossbill split into these different lineages is something of a mystery. Did speciation occur during the last glacial period—when the ranges of many western conifers were more isolated than they are now—or did it occur more recently? Future studies of crossbill genetics may help answer these questions.

Unfortunately, time seems to be running out for some of these birds. In a second paper, Benkman discusses how contemporary forestry practices may ultimately drive some crossbill types to extinction. Crossbills depend on an abundant supply of cones. Most conifers do not begin to produce cones until they are 20 to 30 years old. As the trees age, they produce larger cone crops; some trees do not reach maximum cone production until they are 200 or more years old. Yet most industrial forest lands in the west are managed on a 40- to 60-year rotation, ensuring that only a small proportion of the forest will be suitable for crossbills. On federal lands such as national forests the situation is slightly better, with rotation ages often reaching 80 or more years. But these conditions are still less than optimal from the perspective of crossbill conservation.

The problem is compounded by the nomadic behavior of the birds. Years of good cone crops are usually followed by one to several years of poor crops. Even the most reliable cone-producing conifers occasionally have bad years. When this happens, crossbills wander great distances in search of food. That's what brings them to Boston or Bozeman or Buffalo, to the delight of local bird watchers. But from a conservation perspective, their unpredictable, wide-ranging habits mean that no single park or preserve is big enough to sustain a healthy population. Only a network of reserves throughout the ranges of the various crossbill species has a chance of protecting these birds.

Boosting the forest rotation age potentially cuts into profits, so there are limits to what we can expect from the managers of private forest lands. But the federal forests are a different story—they belong to all Americans. Preserving the remaining old-growth forests and lengthening rotation ages on the managed lands would be big steps in the right direction. Whether any of this will happen may be decided in the coming months as the White House and Congress grapple with the controversy over the ancient forests of the Pacific Northwest.

Before bird watchers race out to add the Douglas fir crossbill, ponderosa pine crossbill, or western hemlock crossbill to their life lists, they would do well to pause and ponder the remarkable, close bond between crossbills and conifers. Other species enjoy a similar bond with forest trees, including the one that lives in wooden dwellings, communicates its thoughts on paper, and is uniquely poised to decide what will be destroyed and what will be saved. ■

Further Reading

Benkman, C.W. "A crossbill's twist of fate." *Natural History*, December 1992; pp. 39-42.

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SQUINTING FOR SCIENCE

by Rick Bonney

Join an army of volunteers counting shorebirds across the Americas

Shorebird: the word sends a shudder through my spine. I have no problem identifying fall warblers, and *Empidonax* flycatchers are easy once they sing. But shorebirds have always been an enigma to me. After 20 years of trying, I'm still apt to confuse a phalarope with a peep.

That's one reason I'm awestruck by the International Shorebird Survey (ISS), a volunteer-assisted project that counts shorebirds throughout the Americas during spring and fall migrations. More than 800 participants contribute to this survey, which is coordinated by the Manomet Bird Observatory (MBO). The data they collect help to identify key shorebird migration sites, detail the timing of migration, document trends in shorebird populations, and determine which species are at greatest risk from habitat loss.

Shorebird conservation is a tricky business. Like all migratory birds, shorebirds require undisturbed habitat on both their wintering and breeding grounds. Equally important, though, are high-quality migratory stopover sites, without which shorebirds will perish.

Why? Shorebird migrations are exceedingly long. Many species, such as the lesser golden plover, breed on the Arctic tundra and winter as far south as Argentina. This awesome migration is a great adaptive strategy. During summer, shorebirds feed on the huge blooms of insects, spiders, and even berries that appear seasonally in the arctic and subarctic regions; during the North American winter, the birds find a second summer far to the south.

But cruising from one end of the globe to another twice a year dictates a series of incredibly long flights, often exceeding 1,000 miles—and at the end of each flight, the birds must replenish their fat reserves by eating enormous amounts of food. Some shorebirds actually double their weight during a two-week rest stop. Such birds require stopover areas with dense patches of food, so they don't waste time and energy in their quest for sustenance.

Good stopover points are few and far between. During autumn migration, more than 60 percent of all North American shorebirds counted by the ISS touch down at just 10 sites. And during the spring, more than 75 percent occupy just two locations, Delaware Bay, on the East Coast, and Cheyenne Bottoms, Kansas. These and other stopover sites are legendary to birders, who visit them on seasonal trips of their own to view thousands upon thousands of feeding shorebirds.

But stopover sites can also be a nightmare, because the destruction of just one site, or even part of a site—whether for housing, industry, power plants, or a host of other developments—can disrupt the migration for millions of hungry shorebirds. As Laura Payne wrote in the Autumn 1991 issue of *Living Bird,* "The chain of critical areas must be maintained if shorebirds are to survive. The disappearance of a single site could break the chain, threatening not just individuals but entire populations of shorebirds."

So shorebird conservationists have two problems. First, they must keep track of shorebird populations to ensure they are holding their own. Second, they must determine exactly which areas are most important as stopover sites and ensure the protection of these sites. How can such a huge task be accomplished?

That's where the ISS comes in. Since 1974, hundreds of dedicated birders—all of whom have freed themselves from shorebird identification phobia—have been contributing information to this program, whose accomplishments epitomize the power and importance of volunteer-assisted science and conservation efforts. Just five years after the program began, Kathleen Anderson, then director of MBO, wrote in her annual report: "Once again we take pride in proving that MBO can combine the efforts of professionals and volunteers in a cost-effective way that brings together information from thousands of miles, information that shows when and where shorebirds are most concentrated and most threatened. These are data internationally needed by governments and private agencies, and which ordinarily would cost hundreds of thousands of dollars to acquire."

Today the ISS is a network of volunteer ornithologists, naturalists, and biologists in North, Central, and South America who regularly monitor and report shorebird use of a selected migratory area. The network includes participants from two dozen nations and most of the United States. The database exceeds 8,000 censuses, and documents the relative importance, seasonal use, and species distributions of shorebirds at 1,050 coastal and inland sites throughout the Americas—information unavailable from any other source. Without these data, the impact of altering a shorebird stopover site could be overlooked or miscalculated.

How are you at shorebird identification? If you can distinguish most of the common species, consider participating in the ISS yourself. It's simple: write to MBO for instructions and data forms, read the instructions, count shorebirds, and fill in the forms.

According to Brian Harrington, director of the ISS since its inception, "Birders can help during the spring or fall migration, or best of all, both!" If your site is a good shorebird area in one, but not the other season, we'd be very keen to know," he says. "The best way is to give us counts for both seasons, but if you can't do that, a simple statement would be much better than nothing."

The fall migration count takes place from July 11 through October 31, the spring count from April 1 through June 10. The exact timing and frequency of counting depend on several factors, such as the number of years counts have been conducted at a given site. All these factors and more are explained in the instructions.

Just what has the ISS accomplished? Consider a few examples of how the data were put to work in 1992:

◆ ISS data for Maine, New Hampshire, and Massachusetts were used by the U.S. Fish and Wildlife Service (USFWS) to identify key wildlife areas along the Gulf of Maine coast.

◆ ISS data on the timing of migration were used by several federal agencies participating in the North America Waterfowl Management Plan to identify the most appropriate timing of shorebird conservation efforts.

◆ ISS data for all Florida sites were provided to the state's Division of Fish and Wildlife for inclusion in a shorebird inventory and planning process.

◆ ISS data from throughout the United States were used in a USFWS effort to improve shorebird population tracking methods.

◆ ISS data were used to develop a shorebird management manual written by D. Helmers of Wetlands for the Americas. This new manual is expected to benefit shorebird populations in both the United States and Canada by jumpstarting management efforts.

Furthermore, back in 1986, ISS data played a key role in establishing the Western Hemisphere Shorebird Reserve Network (WHSRN), and substantiated proclamations by the governors of Delaware and New Jersey that established the first WHSRN shorebird reserve at Delaware Bay. WHSRN, also headquartered at MBO, gives international recognition to critical shorebird habitats and promotes their cooperative management and protection.

What does the future hold for shorebirds? Like many other birds, some species appear to be in trouble. Analysis of ISS data collected between 1974 and 1983, for example, showed declines of 60 to 80 percent in populations of sanderlings, whimbrels, and dowitchers.

But with the ISS and WHSRN programs in place, the future is not bleak. Shorebird populations can be preserved, and with diligence, volunteer programs like ISS will spearhead the effort. ■

For more information, write: International Shorebird Survey, Manomet Bird Observatory, Box 1770, Manomet, MA 02345.

MICHAEL BAYTOFF

Shorebirds by the thousands gather at stopover sites during migration, to refuel for the next leg of their journey. Above, a mixed group of red knots and ruddy turnstones.

GETTING A LEG UP ON BIRD SIGHTING SHEETS

by Pete Dunne

Without a sideways glance, my dog, Moose, gained the fire hydrant and began his standard olfactory analysis. Starting low, working up along the hydrant's length, he reviewed the passings and the fortunes of his fellow canines.

Sometimes a particularly poignant entry would catch his attention, and his nose would pause and ponder. Sometimes his nose would interpret something that rated a derisive sniff, and he'd move on quickly. Finally, his analysis completed, Moose saluted the post with a raised rear paw, adding his name to the list.

That's when it hit me. I've seen this behavior before—and so have you. It's a near universal practice among birders. It's called checking the bird sighting sheet.

It happens every day, in open air pavilions and visitor centers all across the country. Set-jawed, errant birders stalk toward the clipboard marked "Recent Bird Sightings" and study the entries. Starting with the most recent sightings, working back, they run their fingers along the list, gleaning the fortune of birders who passed this way.

Chancing upon a noteworthy sighting claimed by a birder whose pedigree is uncertain, they sniff. Discovering that some other top dog has beaten them to print on a good bird, they bristle.

And when the review is completed they get to make their own mark. They raise a pen and sprinkle the page with a stream of hot, new entries—to post notice of their passage, to offer testimony to their skill.

It's "D. Boone kilt a bar on this tree" with a birding spin. It's ritual posturing played out in the honest name of shared interest and free speech.

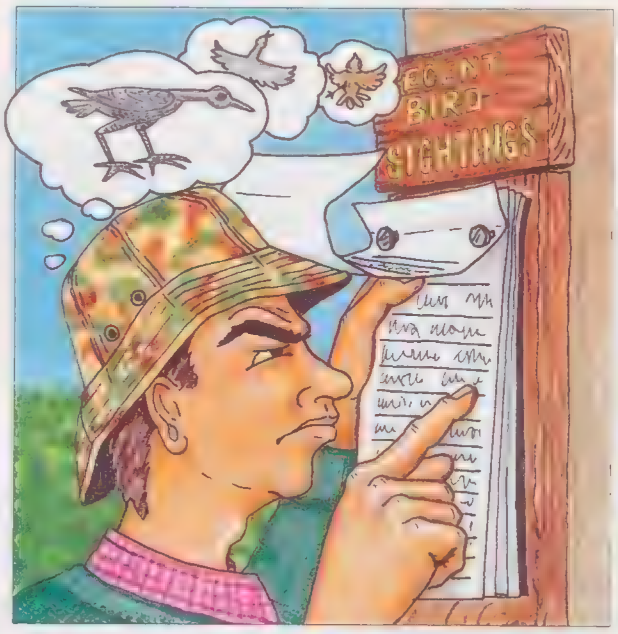
Most of the time these posturings are simple and straightforward:

"9/2/92—5 buff-breasted sandpipers; 2 imm. Baird's; Block C-5—B. Goodbirder."

"3/15/93—Ad. m. Eurasian wigeon feeding in mixed flock east side of Ocean Drive—I.C. Furst"

Sometimes entries are elaborate—actual dialogues between birders debating the merits and antimerits of an identification. (I recall a stint sighting at New York's Jamaica Bay National Wildlife Refuge that touched off a war of words that consumed pages).

Sometimes sighting sheets set the stage for real-life drama. Several years ago a bitter duel was played out on the pages of the bird sighting sheet at Bentsen Rio Grande State Park. At issue was one of the most fundamental tenets of birding—shared information.



On one side of the issue stood several local birders who were logging directions to a roosting long-eared owl (a local rarity). They were exercising the right of free speech. On the other side was the individual who had discovered the bird and who was leading people to the site for pay. He was exercising the right of free enterprise (and carefully crossing out written directions to the bird from the sheet).

Free speech versus free enterprise, but the exchange was settled by an act of free will. The bird left (leaving the issue unresolved).

Not all the information imparted in bird sighting sheets is informative or even valid. In fact, some of the things that find their way into print don't even relate to birds. For example, the knee-jerk notations of people who can't distinguish bird sighting sheets from visitor logs: "John and Mary Pseudonym—Just Visiting—Lovely Park."

Or the trite musings of feeble-minded individuals who use bird sighting sheets to demonstrate how clever they are: "Woody Woodpecker—Identified by call—*Ha-ha-ha*-Ha-*ha*."

Oh, I'll admit that some of the feathered fictions that find their way into sighting logs brush the limits of the clever registry. For example, Cape May Point State Park, New Jersey, enjoys a rash of penguin sightings every summer. Visiting birders are startled by this—until they realize that the park's beach is adjacent to St. Mary's by the Sea, a summer vacation retreat for Roman Catholic nuns.

Birding's ethic of honesty prevents real birders from resorting to creative chicanery of this nature. But the ethic does not extend to several wry-minded surrogates of my acquaintance who travel the country, attaching my not-so-illustrious moniker to sightings like: Canada goose (a bird I actually like) and sea gull (regrettably, a bird I've never seen). I only wish I could travel as widely as my name.

My all time favorite notation in a bird sighting log was anonymous. It didn't even relate to a particular bird. It celebrated an event. It happened one Memorial Day weekend, the closing days of spring. Migration had been poor (some said nonexistent) that season and many mornings had come and gone without the fallout everyone dreamed of.

Then, on Saturday morning, birders up and down the eastern seaboard woke up to an avalanche of birds, a tidal wave of color and song. No mere list of sightings could do justice to that day. But one anonymous birder found apt words for the occasion. In letters that spanned two pages of the log he wrote three words:

"THIS IS IT!"

And that, so simply and eloquently put, was that. ■

ILLUSTRATION BY JEFF SIPPLE

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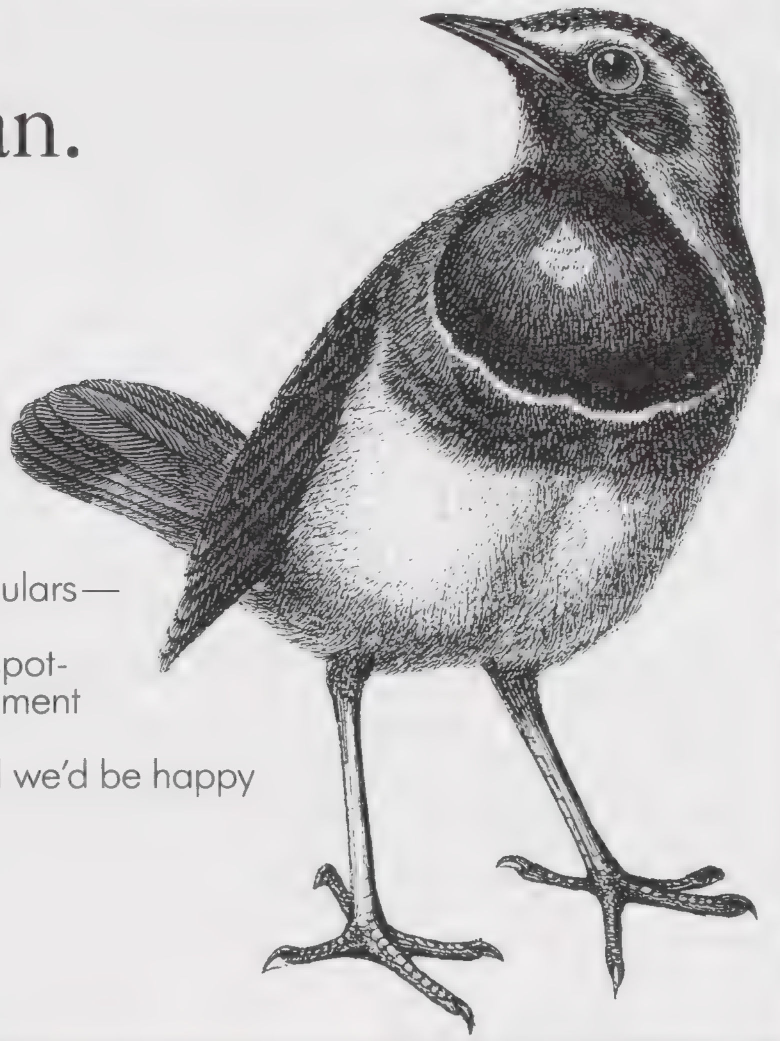

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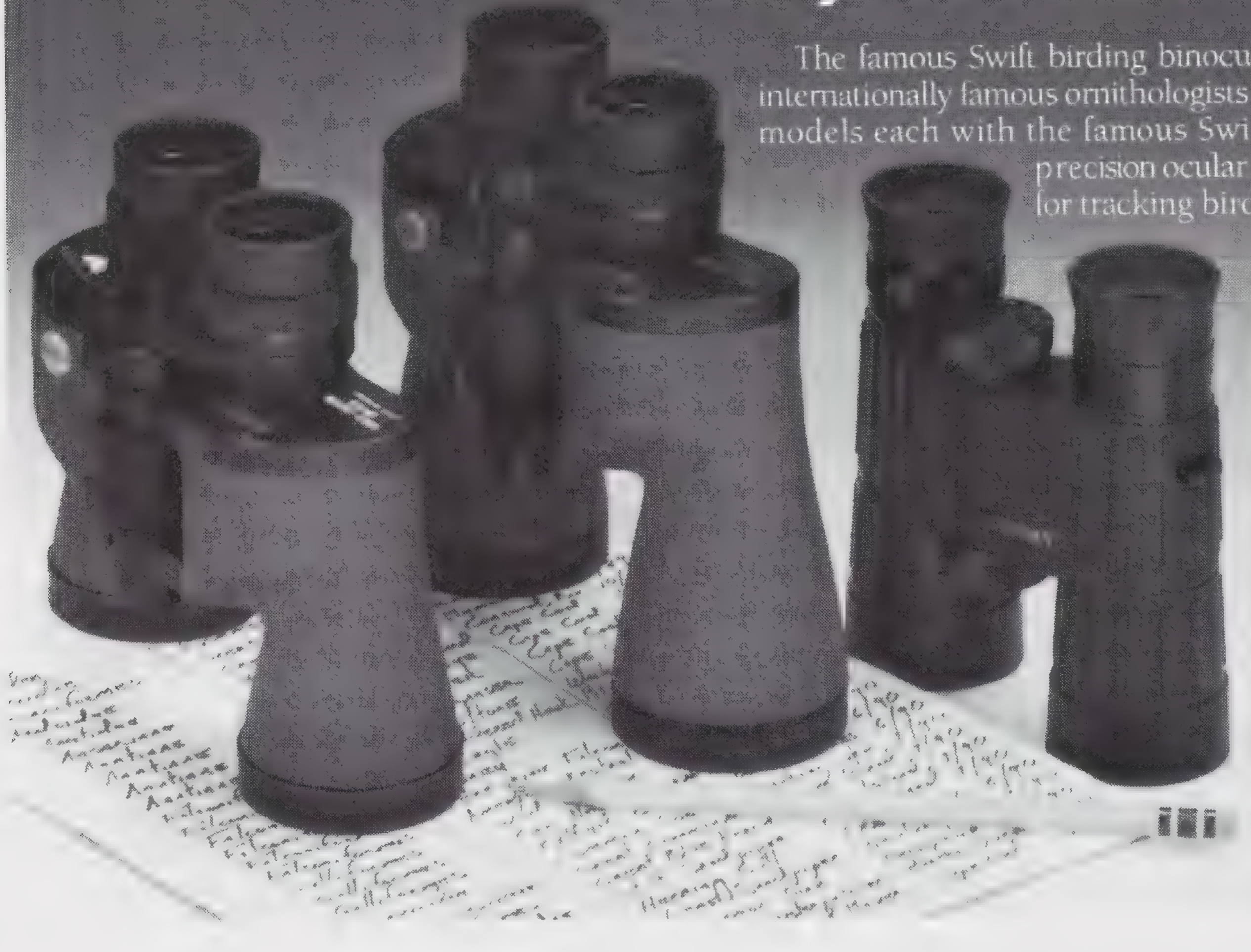

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WINTER 1994

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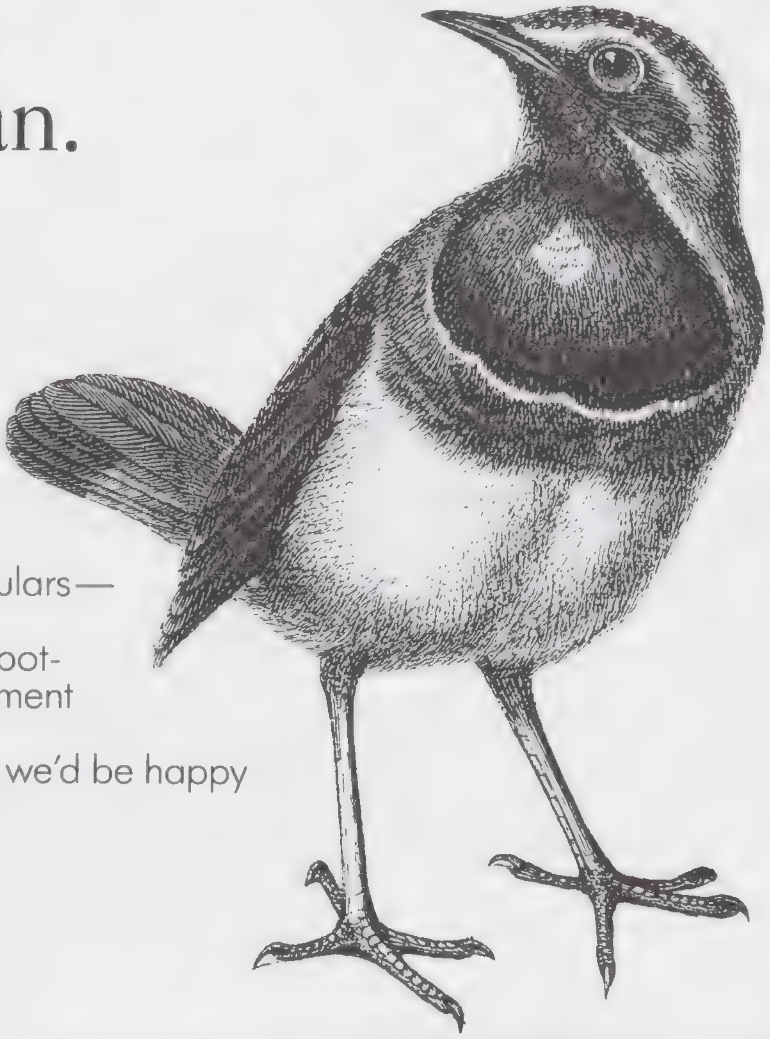

A Publication of the
Cornell Laboratory of Ornithology

LIVING BIRD

WINTER 1994 VOLUME 13 NUMBER 1

Greetings from Sapsucker Woods

If you noticed anything different about the Autumn 1993 issue of *Living Bird*, congratulations . . . you have keen eyes. That was the first issue of the magazine printed on recycled paper. I purposely delayed announcing the change to see whether any readers would notice. So far no one has complained and, in fact, several Lab members wrote to compliment us on how colorful and attractive the last issue was.

I think it's important to use recycled paper whenever possible in publishing. By taking that step we produce less waste and slow the demand for more landfills. We also use up less of our limited natural resources. *Living Bird* and other publications that insist on using only recycled paper are sending a strong message to the paper companies that they must produce more recycled paper products to remain competitive in this market.

I hope you'll take a moment to look at the current issue. Is the picture reproduction quality on the recycled paper as good as in previous issues of *Living Bird*? Is the type as readable? As always, we appreciate hearing your comments.

On another note, we had our first decent snowstorm of the season the other day at Sapsucker Woods. It covered the trails and boardwalks with snow and dusted the trees powder white. I recall that earlier this year we had major snowstorms in March and April. I shudder to think how many months of cold weather might lie ahead. I have a friend who has an interesting perspective on the changing seasons: He considers autumn snowfall to be the first sign of spring. Some people are born optimists.

I hope you all have a great holiday season and a happy New Year.

—*Tim Gallagher*
Editor-in-Chief

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Happy Birthday, Uncle Pete.

Cover: *An adult bald eagle sits out a snowstorm in southeastern Alaska. Each winter, hundreds of these majestic raptors gather along the Chilkat River to feast on a late run of chum salmon, headed upstream to spawn. Photograph by Kathy Watkins.*

Right: *Animal tracks are the only signs of life on the trails and boardwalks of Sapsucker Woods after a long night of snowfall. Photograph by Tim Gallagher.*

Back Cover: *A holly berry makes a tasty, nourishing snack for this American robin. Photograph by Gay Bumgarner.*

LIVING BIRD
WINTER 1994 VOLUME 13 NUMBER 1

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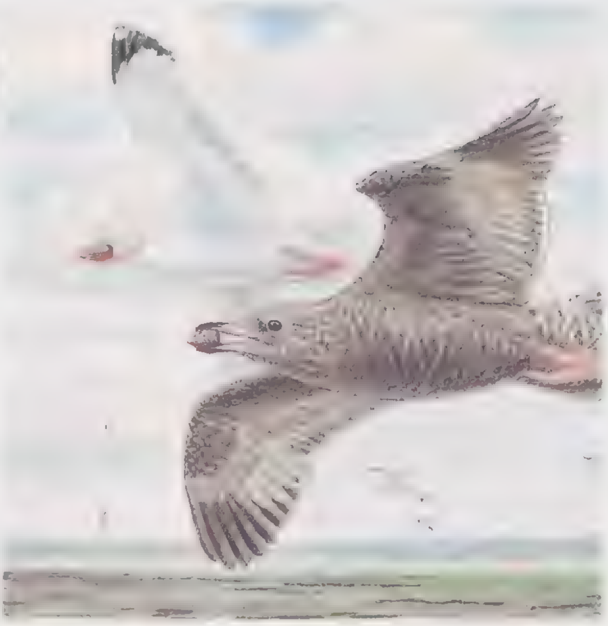
Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts. © 1994 Cornell Laboratory of Ornithology.

Printing by Cayuga Press, Ithaca, New York
Color separations by Brodock Press, Inc., Utica, New York
Printed on recycled paper

Letters


JOHN SCHMITT

SPECTACULAR SHELL DROPS

In response to your request for information on shell dropping by gulls ("The Shell Game," by Jack Connor, Summer 1993), I wondered if you were aware that the death of the Greek tragic poet and dramatist, Aeschylus, relates to your interest.

He was killed in Sicily, in 456 B.C., when an eagle dropped a tortoise on his head, mistaking his bald pate—he was nearly 70—for a rock. Or so it was reported in antiquity by several authors.

George C. Myers
Stuart, Florida

I have observed California gulls dropping sticks along the lower reaches of the San Lorenzo River. One- and two-year-old gulls pick up small sticks, fly up to heights of 2 to 15 meters, then drop the sticks on sandbars in the river. I have seen this behavior only in the spring. Adult gulls do not engage in stick dropping.

The "stick-droppers" also manipulate sticks and bits of debris in their bills without carrying them into the air. I surmise they may be perfecting some technique of selecting or carrying nest material.

David L. Suddjian
Capitola, California

The enclosed clipping from the *Bar Harbor Times* is not exactly the type of information you were looking for, but you may find it of interest [see below].

John P. Murnane
Sorrento, Maine

A Spine-tingling Tale

by Earl Brechlin

ACADIA NAT'L PARK—A New York woman will go home with a spine-tingling summer vacation story after being injured by a sea urchin dropped by a passing seagull at Ship Harbor, Monday.

Carole Bildstein was sunning herself on granite ledges when the gull hovered overhead and dropped a live sea urchin in order to crack its spiny shell on the rocks. A number of gulls were feeding in tide pools in the area, rangers said.

The urchin struck Bildstein flat on the back and stuck there with several of the sharp green spines breaking the skin. "Some of the spines were imbedded," according to reports.

Rangers administered first aid by removing the spines. Bildstein, whose injuries were considered very minor, was directed to go to the nearby Southwest Harbor Medical Center if she desired further medical attention.

MORE ELEPHANTS, PLEASE

Thank you very much for the article on the "large, wrinkly, gray animals with trunks and no feathers" in *Birdscope* (Summer 1993). Please, please, please, continue to report on the Elephant Project.

I think the idea to combine *Birdscope* and *FeederWatch News* is probably a good one, even though it is going to complicate my filing system!

Alleen Engle
Wichita, Kansas

We welcome letters from readers. Address letters to: The Editors, *Living Bird,* 159 Sapsucker Woods Road, Ithaca, New York 14850.

BLUE JAY BY WAYNE LANKINEN

THE SWEET WITH THE BITTER

Blue jays love acorns, even though they're loaded with tannins, the astringent compounds that give tea its bite. Once swallowed, tannins bind with proteins, making them unavailable for digestion. How do jays stay fat and healthy on such an indigestible diet?

The secret, according to South Dakota State University researcher Carter Johnson and colleagues, may be a repulsive dietary supplement: the wormlike larvae of acorn weevils (*Oecologia*, vol. 94, pp. 159-164; 1993). Widely considered forest pests, weevils chew tunnels through acorns, often preventing them from sprouting.

In a laboratory experiment, the researchers found that jays on weevil-free or "weevil-lite" diets lost weight rapidly. But when captive blue jays supplemented their daily acorns with 5 grams of weevils, they kept their weight up. Something about the weevils—possibly the extra protein they supply—seems to counteract the tannins' ill effects.

Thus weevils may not be such pests after all. Blue jays cache acorns for later consumption, but they don't eat every acorn they hide; the leftovers produce new trees. By enabling jays to digest acorns—so they have the energy to fly long distances and hide more acorns—weevils may be helping oak forests to spread.

A MATTER OF RECORD

Data from the Lab's Nest Record Card Program may shed light on the role of the brown-headed cowbird (a notorious nest parasite) in migratory songbird declines. Pennsylvania State University researchers Jeffrey Hoover and Margaret Brittingham gleaned information from 855 of the 4" x 6" cards—donated to the Lab by hundreds of volunteer nest searchers nationwide—for their study of brown-headed cowbirds and wood thrushes (*Wilson Bulletin*, vol. 105, pp. 228-238; 1993).

Originally found on grasslands west of the Mississippi, cowbirds recently expanded their range into the northeastern United States. They lay their eggs in other birds' nests, a habit that may be partly responsible for the startling recent declines in some eastern forest songbirds.

Dividing the eastern United States into three regions—Midwest, Mid-Atlantic, and Northeast—Hoover and Brittingham predicted that cowbird parasitism would be highest near the birds' historic home range. Nest Record Card data supported this prediction—the highest rate of parasitism was in the Midwest, where cowbird population densities also were greatest and wood thrush population densities were lowest.

Despite the Midwestern onslaught, wood thrush populations there aren't declining any faster than populations in other regions; the researchers call for similar studies on other songbird species.

BETTER THAN MULTIVITAMINS

If you're a new parent who's tired of changing diapers, consider this: many parent birds routinely eat their nestlings' neat little membrane-bound packets of waste, called fecal sacs. Now Cornell ornithologist Kevin McGowan dares to ask the question: "Do parents eat poop because they want to, or because they have to?" In other words, do the sacs contain some nutritional element parents need, or is sac swallowing just less work than carrying the stuff to a disposal site?

Studying nesting Florida scrub jays and American crows, McGowan found that females ate more fecal sacs than males. If both parents were present when a sac was produced, the first bird to leave the nest didn't necessarily take out the trash. McGowan concludes that, for female birds stressed by the rigors of egg-laying and incubation, fecal sacs supply a nutritional boost.

IN MEMORIAM

The Lab is sad to report the death of **Crawford H. Greenewalt** this past September. Greenewalt, the former chairman of the board at Du Pont, was noted in ornithological circles for his independent research on hummingbird flight and the physiology of bird song. He served on the Lab's Administrative Board from 1955-68 and took a leading role in launching the Lab's Bioacoustics Research Program. The success of this program stands as testimony to his energy and vision.

In late August, the Lab lost another great friend and long-time Administrative Board member, **Robert G. Engel**. A 1953 graduate of Cornell University and an ardent bird enthusiast, Bob was an executive with J. P. Morgan and Company before his retirement in 1991.

Bob joined the Lab's board in 1976; as chairperson of our board nominating committee, he built a core of solid advisors. He will be missed.

The death of **Lewis Pearsall** last July touched many Lab staffers and friends; he had been a Lab employee for 22 years before his retirement in 1981. Pearsall helped Lab codirectors Arthur A. Allen and Peter Paul Kellogg design the first effective parabolic reflector for sound recording in the early 1960s; he became Lab property manager in 1965. Friends say his versatile talents touched every aspect of the Lab during his time here.

COMPILED BY CYNTHIA BERGER

In the Field

KILLDEER WATCH

by Jack Connor

With kids and dogs romping all around, how long could the killdeer nest last?

When you have been watching birds as long as I have, you learn to predict events long before they happen. My notes about the killdeers at the ball field last year show that right from the beginning I knew what would happen to them.

2/8/93: Sunday morning, temperature in the teens. Creek frozen from spillway to bridge with just a few openings. No ducks in sight; one kingfisher rattled by. Found first killdeer of the year standing in icy edge near the boat ramp; flew away calling when I walked closer. Saw another just beyond the ball field, near the artesian fountain there. Killdeers try to nest around the ball field every year, it seems. Sad. With all the dogs and human disturbance, it's a hopeless situation.

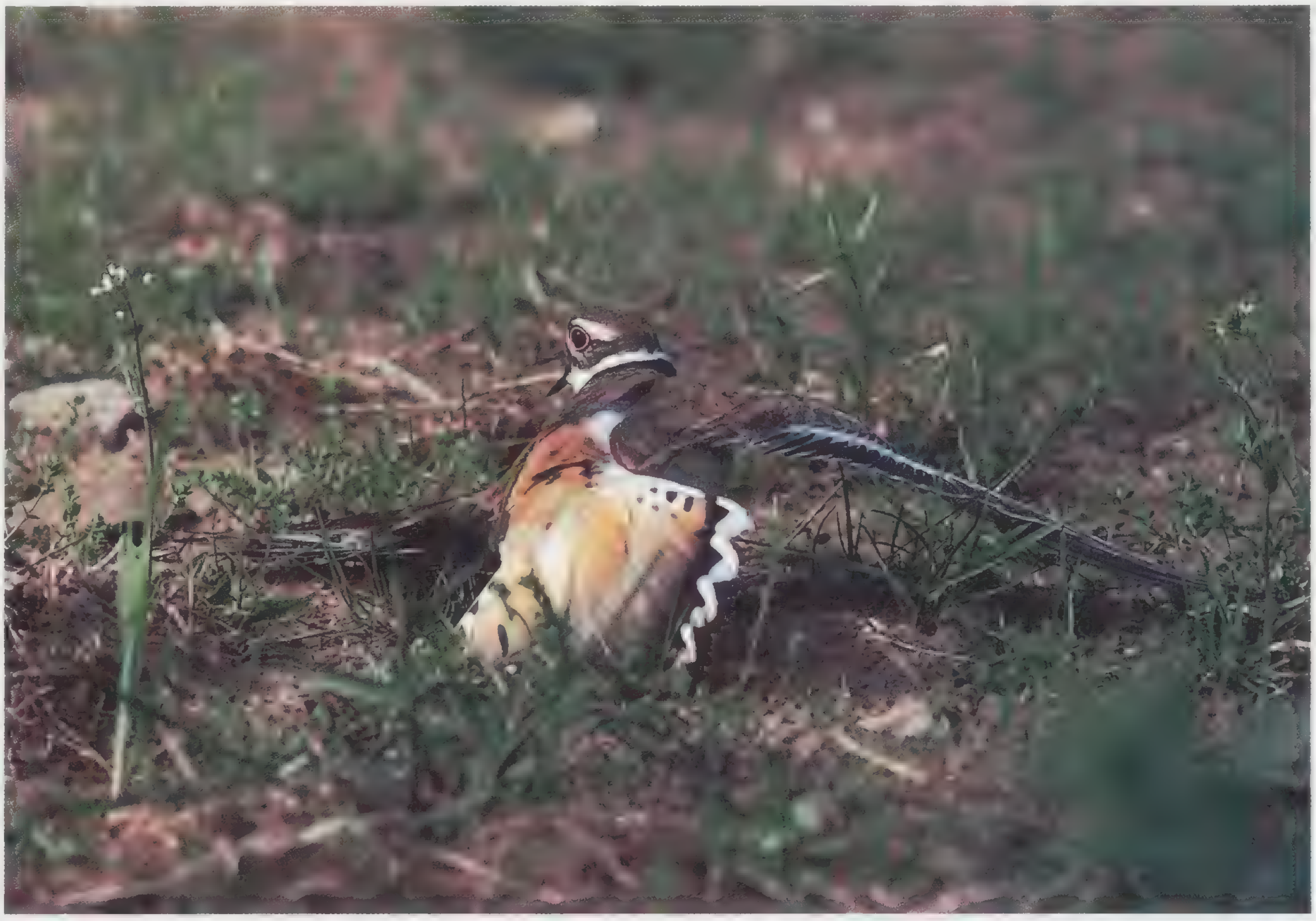
There's no further mention of killdeers in my journal until two months later, when my daughter Colette came home from walking her dog one evening to say she'd seen a nest with four eggs on the ground near the baseball field and wanted to show it to me. "We better look at it first thing in the morning," I told her, "before somebody steps on it or someone else's dog finds it."

We bicycled down there the next day before school. The baseball field stands between Nacote Creek and the City Hall building on Main Street; the loop road bordering it leads to the boat ramp and is the most popular place in town for dog walking. Colette led me to a spot on a little slope between the backstop and the start of the loop road, about 50 yards from home plate. The scattered sticks, chips, sand, and grass there made a patchwork camouflage that hid the eggs so well she couldn't find them again. We searched for 10 minutes, until Colette had to leave for school.

As soon as she rode off I heard an odd call, a trill somewhere between a pine warbler's and a chorus frog's. Along the right field foul line a killdeer was doing a distraction display—bobbing and squatting, wings bent awkwardly, tail spread to show its orange rump. I walked toward the bird, playing the role assigned me. It hurried along, 20 to 30 yards ahead, stopping when I stopped, then trilling and showing the orange again. We circled all the way around to center field until it flew, landed another 50 yards ahead, and looked back at me over its shoulder. Was I fooled? "I'm not who you have to worry about," I told it.

On the way back, looking again with fresh eyes, I finally found the nest a couple of steps from where Colette had said it was—four eggs, small ends touching, all of them greenish-gray with smudgy chocolate spots at their large ends. That night I wrote in my notes:

The perfect background of sticks, rocks, and sand must be what lures the killdeers here—



BRUCE LYON

"Along the right field foul line a killdeer was doing a distraction display—bobbing and squatting, wings bent awkwardly, tail spread to show its orange rump. 'I'm not who you have to worry about,' I told it."

misled by their instinct for camouflage. The site is otherwise a poor choice, with dogs and kids tromping through every day, crows overhead, raccoons in the woods, cats up and down the street, pickup trucks parking on the grass.

Illustrates the principle that on average each adult bird raises just one young to adulthood in a lifetime (in a stable population). In other words, most nestings fail.

Some luckier or smarter pair of killdeers must be raising four young to make up for the ball field pair, I decided. I took my notebook along on my next visit, so the analysis moves into present tense.

4/18/93: Killdeer eggs still here, amazingly. Incubation period a month; can they last another week?

Watching from trees beyond fountain; a good vantage point 100 yards away or so. Bird on nest visible on slope.

8:50 A.M. *People arriving to play softball. Three carloads, a dozen kids and fathers running around, bats clanging. Weekends probably the most dangerous time of all [for the killdeers].*

8:57 A.M. *A couple with two dogs—a tiny dachshund and a huge red mutt—arrive at top of road and both open their leashes and let the dogs go, 75 yards from nest. The dogs charge ahead. This is probably how nests here fail each year. Stay quiet, killdeers.*

Killdeer #2 watching dogs, it seems, like a lookout. Preparing to defend nest with distraction display if necessary? Might work with one dog, not two.

8:59 A.M. *They have shifted places! Neat to see. Killdeer #2 (the male?) walked toward nest. Could tell mate was growing restless? She signaled to him somehow? When he was about 10 yards away, she flew—quietly, no call—right toward me. Went to puddle under fountain, picking for food. #2 settled down on nest, lowering himself so head just visible.*

My notes end there because a few moments later the killdeer at the fountain flew off as the red mutt charged up to me to sniff my legs. The dogs and their owners had circled the field. "Rachel, down!" shouted the man.

"You must have a dog," he said to me. I did, I told him. He said something else, but I wasn't listening. Another van had arrived. Parents, players, and assorted smaller children piled out, and a moment later an errant throw sailed over the fence, then bounced and rolled up the slope. One man hopped the fence and trotted over, looking back over his shoulder at the field while his feet crunched sticks and chips and all else in his way. The killdeer stayed on the eggs, still as a stone. The man picked up the ball and heaved it back.

When another dog walker appeared at the top of the road, a man with a German shepherd, I couldn't watch any longer. I climbed on my bicycle and pedaled home without looking back.

That night's notes show my analysis had moved beyond the imminent destruction of the nest to the contemplation of other questions.

How did those two killdeers choose this spot? Couldn't have been raised here or succeeded nesting here in past years. An inexperienced pair who can't find (or recognize) a more suitable spot? Why not nest in one of the farm fields [outside town]?

For 10 days I stayed away from the ball field. Then one morning, pedaling to the creek in pursuit of terns and swallows, I stopped for a moment at the head of the loop road and scanned the slope. The nest was gone by then. I knew it would be. I got off my bike, walked over to look for shell fragments, saw nothing but sticks and rocks, and decided that whatever had eaten the eggs had probably swallowed them whole. The adults were gone too, I was glad to see. Maybe they'd finally learned their lesson and moved out of town.

But as I turned back toward my bike a movement under the fountain caught my eye. I lifted my binoculars, gulped, and yanked out my notebook.

4/28/93: Two of the killdeer chicks made it! Feeding under the fountain with one parent. Heads hiccuping up and down. Mother turning head to eyeball sky, calling to them softly, deer, deer, deer. *One chick trots over and stands under her. If they were mammals, nursing would have begun.*

There are 3 chicks! Hard to count because all foraging by themselves. Picking at the ground—running a few steps and jabbing for prey just as adults do. Chicks running back and forth, toward mother then off into the grass. Mother seems to—

There are 4 of them. All 4 of them made it!

BRIGITTE DE SAINT PHALLE

"Two of the killdeer chicks made it!"

I swept my binoculars across that scene at least a dozen times, re-counting them: one chick here, another two here, a fourth over there. While one ran to the mother, the one who had been beneath her scurried out, chasing prey too small for me to see. The third and fourth wandered 5 yards away into deep grass. The mother called again, softly, *deer, deer.* The wanderers scurried back. I counted them again: one, two, three, four. And one more time: one, two, three, four. Four perky fuzzballs living in the wild.

But how long would they survive? The fledging period for killdeers is 25 days—three-and-a-half weeks of danger—and the odds were stacked against them. I figured they could still be eaten by a dog, run over by a pickup, beaned by a softball, or shot by a sniper. Soon afterwards, however, I left for a long trip away from home and so stopped predicting their fate in my notebook.

A month later, a couple of days after I came back from the trip, I bicycled down Main Street, and half a dozen killdeers flew up from the cemetery across from the ball field, calling to each other happily: *killdeee . . . killdeee . . . killdeee.*

Where that little flock of birds came from I am not sure. When you have been watching birds as long as I have, you learn you shouldn't feel too sure about anything. ■

Corridors *for* Conservation

Do habitat-connecting corridors really help birds?

by Daniel Simberloff and Mary Tebo

When loved ones have serious health problems, it's tempting to seek miracle cures. Even normally objective people sometimes cast aside good judgment to embrace questionable treatment. No matter that the alleged cure is expensive and not supported by evidence. No matter that loved ones may suffer when we forsake tried-and-true alternatives because they're too slow or too difficult. The quick fix has great appeal—even when the loved ones we're trying to save are declining species of birds and other wildlife.

The quick fix, in this case, is movement corridors. Over the last 20 years, the idea of corridors has become increasingly popular. For the purposes of conservation and land acquisition, movement corridors are defined as strips of land that are intended to allow wildlife to move between larger habitats. More simply, movement corridors are supposed to provide a route for species to move from one large chunk of undeveloped habitat—usually a state or federal refuge—to the next.

These strips of land need not follow a particular geographical feature, such as a mountain range or river, that would define them as habitats unto themselves. Nor must they be any specified width or length. Forestry companies in Australia and North and South America propose corridors about 50 yards wide and a few hundred yards long, whereas a proposed national corridor running from Canada to south Florida would be 300 yards wide and more than 2,000 miles long.

Birds and mammals are the two animal groups most often featured in the campaign to promote corridors. Flight makes birds particularly mobile, so it may seem surprising to think that they would have difficulty dispersing. But the fact that most birds *can* fly does not automatically mean that they *will* fly over inhospitable or unusual terrain.

Evidence that corridors might be useful to some birds comes from a long-term study in Brazil. In 1979, the World Wildlife Fund and the Smithsonian Institution created a series of rain forest "islands," ranging in size from 2.5 to 25,000 acres and surrounded by clearcuts and second-

ILLUSTRATION BY STEVE CARVER

growth forest. Since then, ornithologist Rob Bierregaard has found that many songbird species have disappeared from the smallest fragments, even though these areas contain apparently suitable habitat. He has also seen bat falcons preying on the few songbirds that wander into the open areas.

Bierregaard suggests that, through natural selection, some of these species now have an innate tendency to avoid open spaces. Some kind of corridor might help these species move from one fragment to another. But Bierregaard has not yet tackled such questions as whether the birds would use a corridor, or how wide it would have to be.

These questions involve the animals' perspective of a wildlife movement corridor. Current corridor theory, however, paints these passageways from a mapmaker's perspective, as lines connecting isolated refuges of various sizes. The appeal of movement corridors is obvious: the concept is easy for legislators and the public to understand, and it seems like a new notion in a time of increasing crisis. But the real questions are: Do corridors work? Do they provide the most conservation for the dollar? And do wildlife actually use these corridors? Not everyone agrees that these questions are important. Wildlife biologist and leading corridor advocate Larry Harris feels the amount of use by wildlife is irrelevant, saying, "Even if only one percent makes it through, that's one percent that wouldn't have made it otherwise."

Actually, scientists have collected few data on what percentage does make it through existing movement corridors, and even fewer data on what percentage would have made it through otherwise. Probably the first paper claiming to demonstrate the effectiveness of corridors is one by Lucy MacClintock and others. This work is often cited as evidence that biodiversity increases at sites connected by corridors.

MacClintock studied birds in a 35-acre Maryland forest patch that was connected by a corridor to a larger forest. The investigators were especially impressed by the number of forest interior species present in the patch, including black-and-white warblers, white-breasted nuthatches, scarlet tanagers, and ovenbirds. The study had a major flaw, however: there was no control. The researchers failed to compare their study site to other isolated sites that were *not* connected by a corridor to a larger forest. Furthermore, the study didn't show that birds used the corridor to move from the larger forest to the patch, and the corridor was never severed to see if any species disappeared from the patch. Thus this study's conclusions are questionable.

Many other studies that claim to prove the effectiveness of corridors similarly lack controls. For example, in the Brazilian rainforest "island" project, one experimental island was fortuitously connected to a larger forest by a 100-yard-wide forest corridor that ran for about a mile alongside a stream. Part of the corridor was subsequently destroyed, and three species of antbirds soon disappeared from the island. This result suggests that the corridor was important to these birds, but the study had no control islands—islands that remained connected to the forest by intact corridors.

To date, very few studies have shown that species travel along corridors instead of through surrounding habitat, nor has any study shown that species diversity increases in two equivalent habitats simply by virtue of a corridor connection. In other words, biologists have usually failed to prove satisfactorily that species are using the corridors instead of making the trip from one site to another—by hook or by crook—without them. If animals are moving outside of corridors, then species diversity will probably decline along with the quality of the habitat between refuges, whether or not corridors connect them.

Of course, different ecosystems, different species, and different corridors will produce different results. In one study in the Western Australian wheat belt, western yellow robins preferred to fly between remnant patches of vegetation along well-vegetated narrow corridors, while singing honeyeaters tended to fly over open ground. Biologists cannot categorically dismiss the possibility that a movement corridor might work in a given situation. By the same token, they cannot casually assume it.

Technical papers in journals give the incorrect impression that extensive empirical data demonstrate the efficiency of movement corridors. Assessing the scientific literature on movement corridors is a difficult and time-consuming job. Land managers and planners cannot be expected to expend such effort, yet without careful scrutiny the public could get the impression that movement corridors are a tried-and-true conservation measure. In a 1990 California case, *Marble Mountain Audubon v. Rice,* the Ninth U. S. Circuit Court of Appeals even ruled that corridors must be considered as a possible conservation tool. The court ruled that a U. S. Forest Service logging proposal for the Klamath National Forest did not consider whether loss of the Grider Creek corridor would hinder movement of spotted owls, peregrine falcons, and several mammal species between the Marble Mountain and Red Butte wilderness areas. The plaintiffs presented no evidence that wildlife were using the corridor for movement or that such movement was important if it occurred.

Supporters of the corridor concept have even

Is it better to preserve a corridor or to preserve places for corridors to connect?

GREG VAUGHN

In a 1990 court case dealing with a proposal to log a corridor connecting two wilderness areas, no evidence was presented that threatened species such as the spotted owl, above, actually used the corridor. Yet the court ruled that the U.S. Forest Service had failed to consider whether loss of the corridor would prevent owls from moving from one area to the other.

BHL

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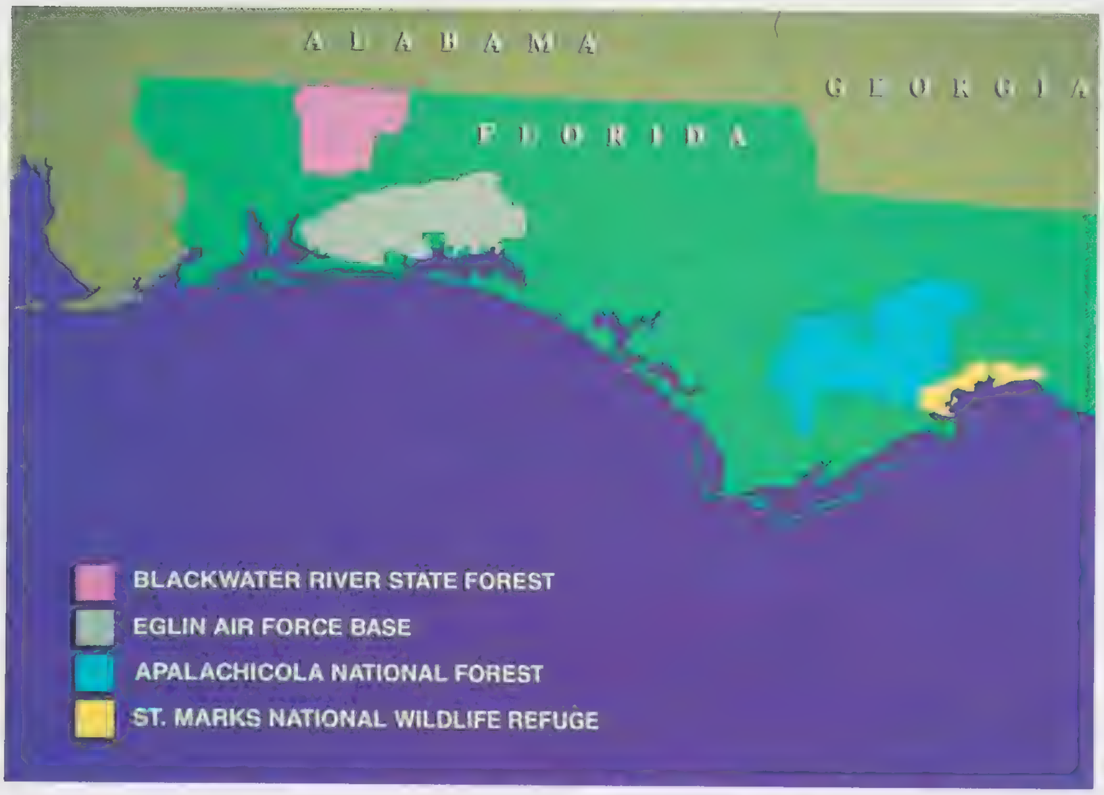
come out with a popular video, complete with musical soundtrack. It would appear that corridor advocates wish to bypass the scientific rigor through which theory can emerge as a reflection of reality. Instead, they aim to establish the legitimacy of movement corridors through public persuasion.

Such a propaganda campaign may ride on good intentions. Many conservationists, appalled at the loss and fragmentation of wild spaces, think that all conservation tactics should be employed now, while land is still available, and questioned later. Scientists Richard Hobbs, Denis Saunders, and Reed Noss concede that the evidence for the value of corridors is very weak. Still, they feel prudence demands the establishment of corridors now, because rigorous scientific tests will take too long.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GEORGIA
FLORIDA
BLACKWATER RIVER STATE FOREST
EGLIN AIR FORCE BASE
APALACHICOLA NATIONAL FOREST
ST. MARKS NATIONAL WILDLIFE REFUGE

DANIEL SIMBERLOFF

Recently, the state of Florida considered an expensive proposal to connect the Blackwater River State Forest to Eglin Air Force Base, above, even though habitat in the proposed corridor wasn't suitable for its most frequently named beneficiary, the red-cockaded woodpecker, right.

The fact remains that corridors are not free. Every dollar spent on a corridor is a dollar not spent on some other conservation measure. The unrestrained campaign for movement corridors is influencing *which* lands are acquired for conservation, and in some cases even determining *whether* certain lands should be considered for conservation.

Consider the Blackwater-Eglin Connector. In 1988 Florida's land acquisition program considered a proposal to purchase a 4-mile-long, 6,000-acre area of the Florida Panhandle. The idea was to connect the 465,000-acre Eglin Air Force Base with the 354,000-acre Blackwater River State Forest and the adjacent Conecuh National Forest. The anticipated price was more than $5,000,000, and the proposed benefit was gene flow and animal movement between the two sites.

No studies showed that any species would move through this corridor, or even that any species were threatened in either site by absence of movement. The most frequently mentioned beneficiary, the endangered red-cockaded woodpecker, would not be likely to use the Blackwater-Eglin Connector. Fewer than 19 percent of breeding females move each year, and fewer than 5 percent of these move as far as 3 miles; of the ones that move that far, only 70 percent survive the year to breed. So the chance that a female will move that far and survive is about 0.7 percent per year.

And these statistics do not even account for whether a bird would find the corridor in the first place. The red-cockaded woodpecker is a specialist that lives in old, undisturbed, longleaf pine forests. The proposed corridor has been heavily logged and consists largely of hardwoods and commercial pinelands; it is also traversed by Interstate Highway 10. Finally, no data exist to show how many woodpeckers are already moving between the two sites without the proposed corridor.

The Florida state land acquisition program is the largest in the nation, but it has a waiting list of several hundred million dollars worth of projects. Thus this corridor would have been purchased at the expense of other conservation projects. The initial application was denied, but the Blackwater-Eglin Connector has been repackaged as the Yellow River Ravines project, which focuses (more properly) on existing species and habitats within the tract rather than its potential use as a conduit. A similar project to connect the Apalachicola National Forest and the St. Marks National Wildlife Refuge (at a cost of $5,000,000) is in the planning stage. This project is equally bereft of any evidence that it will promote wildlife movement.

The Pal-Mar project in Florida illustrates how corridor theory can even disqualify an important site for acquisition. This project involves almost 20,000 acres in Palm Beach and Martin Counties. The site is a system of flatwoods and prairies containing many endangered plant and animal species—perhaps the biggest relatively undisturbed, functional wetland in south Florida east of the Everglades.

After this site was submitted for consideration to Florida's land acquisition program, state personnel recommended adding a mile-wide, 6-mile long corridor to connect it to a state park. The addition of the corridor doubled the estimated price of the project from $22 million to $43 million. Furthermore, the recommendation stated that such a corridor was *key* to the whole project and should be acquired *before* the originally proposed acquisitions. (The recommendation failed to mention that the proposed corridor is crossed by Interstate 95 and the Florida Turnpike.)

In this case, the perceived value of a corridor threatens the purchase of a valuable habitat. Because the price tag is now so high, all parts of the project—including perhaps the most important

parts—may not be funded. The Pal-Mar project also illustrates how corridor theory can cast doubt on the usefulness of an isolated refuge, even though many well-managed, isolated refuges (even small ones) continue to maintain populations of targeted key species.

Biologist M. L. Hunter and his colleagues have come up with a deluxe version of the notion that corridor-connected refuges supersede isolated refuges in worth. They advocate a 300-yard-wide corridor stretching from Canada to south Florida, to facilitate movement in the face of global warming. If funds are available to buy this much land (300 square miles), wouldn't they be better spent purchasing intact ecosystems than on a wildlife highway that may or may not be used?

R.D. WILBERFORCE

Ring-necked pheasants, above, thrive along railroad right-of-way "corridors" in South Dakota. Habitats such as these, which are long and narrow because they follow some geographic feature, should not be confused with movement corridors.

The costliness of the movement corridor campaign strips it of the claim that it can't hurt. The enormous price of some corridor proposals means that other options will not be pursued. Thus, even if 1 percent of wildlife use the corridor, they might do so at the expense of a much larger percentage that would have benefited from an alternative strategy. Other options include traditional conservation measures: protecting unique habitats that support unique communities, or establishing large refuges for animals with large ranges. These options also include more recent approaches such as the "new forestry," a collection of methods that proponents feel might make even logged forests more useful for conservation.

A related approach is managing an entire landscape so that human activities are compatible with conservation of the entire biotic community—even if unexploited refuges compose but a small fraction of the area. Corridors might be one component of such a comprehensive strategy, as might a network of "stepping stones" (small, unconnected patches of undeveloped habitat that are close together). But a shortage of funds means we can't pursue all possible courses of action. We have to make choices, and they should be based on scientific evidence and cost effectiveness.

Supporters of the corridor concept stress its easy appeal. Yet part of this appeal stems from the fact that people easily confuse movement corridors with natural habitats that happen to have a linear shape because of an integral geographic feature, such as a river or mountain range. These habitats have also been dubbed "corridors," and they do deserve protection as habitats for the species adapted to them.

For example, many riparian habitats, such as streamside forests, are threatened. Cottonwood/willow forests along streams in the American Southwest support bald eagles, gray hawks, common black-hawks, Bell's vireos, and American redstarts, all state or federally listed as threatened or endangered species. More than 90 percent of South Dakota's pheasants are found along railroad and highway right-of-way "corridors" that are managed to approximate the birds' natural habitat of open brushland and marsh.

Another frequent argument in support of corridors is that the public and legislators find the concept easy to understand; people can feel they're working for conservation by working for corridors. But is it good conservation biology to sell legislators and the public on the program that's easiest to understand, in the absence of evidence that it's the most effective one? Is it in the public interest to tell people movement corridors are a cure-all when many of them may not work at all? Finally, is it better to preserve a corridor or to preserve places for corridors to connect? Conservation of large spaces, as well as valuable small ones, is not always easy or quick. But it may be the only antidote for the decline of native species. ■

Daniel Simberloff is an ecologist and conservation biologist at Florida State University in Tallahassee. He is especially interested in the interactions among species that coexist in the same community. His wife, Mary Tebo, is a writer and editor with the Florida Department of Education who specializes in nature writing.

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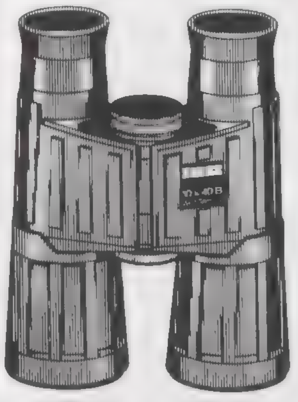

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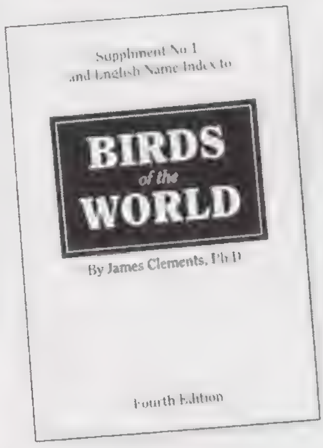

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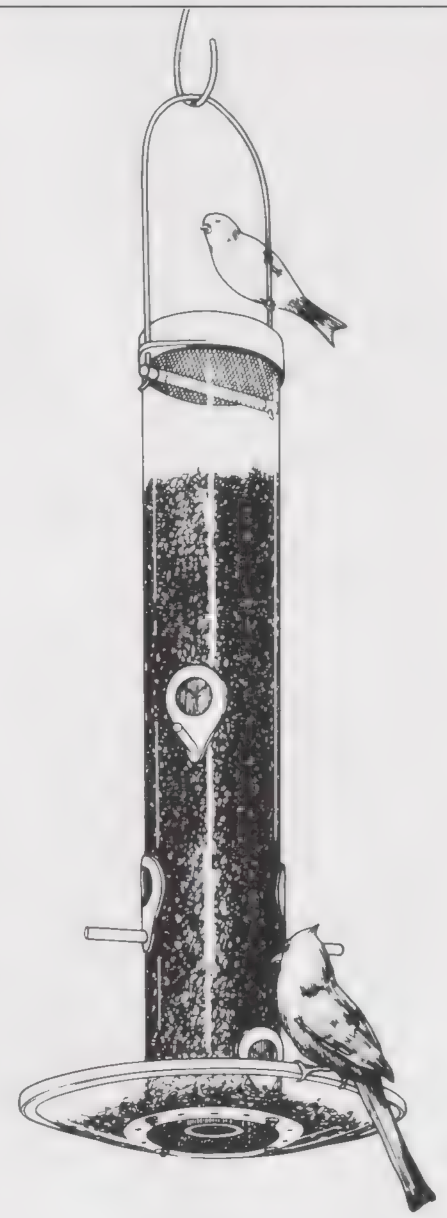

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Counting Birds in Honduras

by Marcia Bonta

You don't have to shiver to take part in the Tela Christmas Bird Count

Slowly we drove through sheets of blinding tropical rain, straining to see well enough to avoid hitting the assorted domestic animals, children, and adults walking on the highway. We were headed toward the city of Tela on the Caribbean coast of Honduras to participate in the

BRUCE BONTA

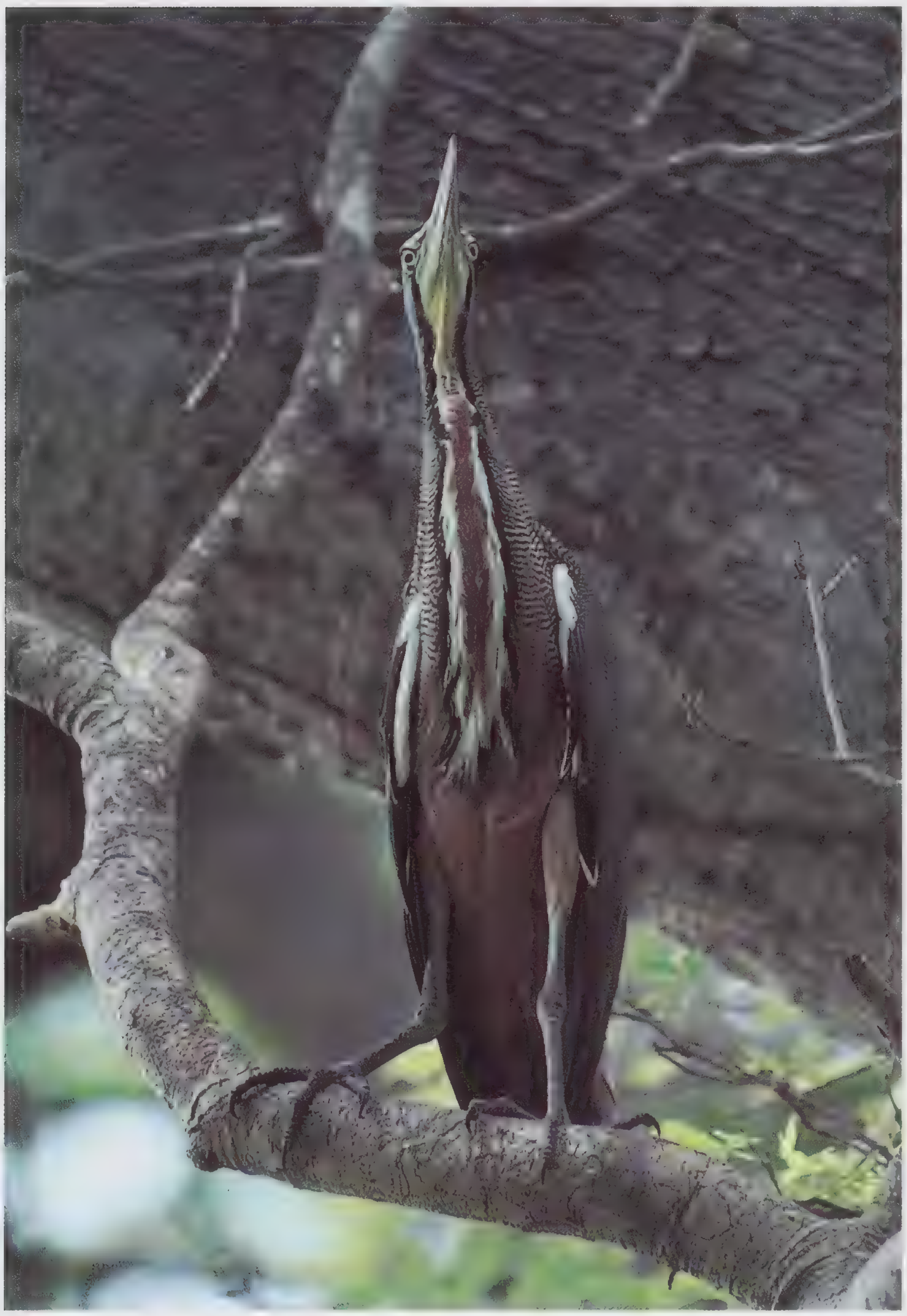
In Honduras, Christmas Bird Count teams, at right, often find T-shirt weather and fascinating species to document. In the 1991 count, one team found the second rufescent tiger-heron, at left, ever recorded in the country.

BRUCE LYON

country's third annual Christmas Bird Count (CBC).

When we arrived, my husband and I found our son Mark, a Peace Corps Natural Resources volunteer and the official compiler for the count, debating with fellow Peace Corps volunteer Dave Anderson over whether or not the bird count would still be held if it rained. Mark recalled that the 1991 count had dissolved into rainstorms, driving all the teams except his off the field early. But his team's persistence had paid off—they identified 82 species, including the second-ever rufescent tiger-heron for Honduras.

BRUCE LYON



Another tropical specialty, a bare-throated tiger-heron, above, peers out at the passing birders. At right, two schoolboys stroll between two rows of royal palms at the picturesque Lancetilla Botanical Garden, the center for the Honduras count.

Like the rest of our family, Mark is a veteran CBC participant. For years we have combed our central Pennsylvania mountaintop, recording as few as 12 and as many as 48 bird species, walking miles over hilly terrain during ice storms, snow, freezing rain, and sometimes intense cold. To Mark and his fellow Peace Corps CBC participants, who come from such places as Rhode Island and Massachusetts, a CBC in warm, sunny, bird-rich Honduras is a dream come true. His letter home, recounting the 1991 Honduran count, succinctly summed it up: "The best CBC I ever had."

Some of Mark's favorite sightings in that count were a snowy egret, keel-billed toucans, five species of kingfishers, magnificent frigatebirds, numerous magnolia warblers and American redstarts, summer tanagers, and barred antshrikes. Trying to record the numbers of birds, as well as species, had kept his team counting every groove-billed ani, cattle egret, and great-tailed grackle.

The counts are important because so little is known about the numbers and habitat preferences of resident as well as migratory birds in Honduras. But the primary value of the CBCs, according to the Peace Corps volunteers and biologists from the National Autonomous University of Honduras who organize the counts, is to promote an appreciation of nature among Hondurans, making them proud of their country's natural diversity and eager to preserve it. Thus, the experienced birders—and each of the four teams has at least two—move slowly, pointing out birds to everyone, so that novice birders can study each species closely and be able to identify it the next time they see one.

Since we are both slow-moving appreciators of birds, this kind of Christmas Bird Count appealed to my husband and me. So we planned our long-anticipated visit to Honduras to coincide with the country's CBC. After several days of birding in a couple of Honduras's most beautiful cloudforest parks, we sloshed into Tela on a storm-blasted December day.

The other CBC participants had already arrived at the Lancetilla Botanical Garden, the center for the count. Established as an experimental agricultural station by the United Fruit Company in 1926, the garden contains over 1,000 exotic plant species. A tropical forest reserve of 800 hectares that protects the watershed of the garden is a drawing card for birders, but they must be accompanied by a machete-wielding local guide, because poisonous snakes are abundant.

It is possible to see almost half of the 715 bird species of Honduras at or near Lancetilla; however, the main reason that the garden was chosen as the site of the Honduran CBC is its accessibility. Honduras is about the size of Pennsylvania, but has few good roads. The best highway in the country runs from the capital, Tegucigalpa, north to the second largest city, San Pedro Sula, and then up to Tela. No matter where most participants come from, that highway is their eventual access point. Thus Lancetilla Botanical Garden is the logical center for what is officially called the Tela Honduras Christmas Bird Count. In addition to the mani-

VINCE MURPHY

BRUCE LYON

At right, an 800-hectare tropical forest preserve protects the watershed of the adjoining Lancetilla Botanical Garden. Nearly half of the 715 bird species of Honduras, including the keel-billed toucan pictured above, can be found at or near the garden.

cured portion of the garden itself, the teams scour several nearby lakes and mangrove swamps, secondary gallery forests, a portion of the Caribbean beach, and a transitional rainforest, the only part of the count that takes place above sea level.

Despite the poor weather, the participants who came to the garden the day before the event were enthusiastic. They completed an intensive, six-hour workshop on bird identification presented by Sherry "Pilar" Thorn, a biologist from the National Autonomous University and one of the founders of the Honduran CBC. At the end of the mini bird course, everyone was properly psyched up and ready to roll out of bed at 5:00 A.M. the following morning, come rain or shine.

As it turned out, the day was warm and cloudy. We elected to join the least strenuous group—that in the garden itself—and left the mangrove swamps and forests to the younger, more agile participants. With the exception of our team leader, Vida Roth, we were the oldest participants by far in the mostly young crowd. An American, Vida has lived in Honduras for decades and communicates well in English and Spanish. She knows her birds. But she also knows her plants, particularly those of the Lancetilla Botanical Garden, and so she mixed in garden history and botany with birding during our count.

Team members must walk during the CBC, except when they need to use boats to get into swamps. Cars are used only to transport teams to their count sites. The CBC organizers believe that walking slows down birding so that novices can see birds better. They also want team members to work for their birds, to promote a greater sense of participation. And work they do.

"We hiked along an abandoned railroad track, choked by sharp-thorned acacia bushes, not seeing many birds and worried about snakes, with twelve people trailing behind," Mark later told us. "A few people fell down a slope, and all of us were eaten alive by mosquitoes. Next year the trail will have to be opened with a machete." But around such stories of tribulations CBC legends are built.

Stories of the birds that got away are also a CBC stock-in-trade. Naturally, Mark had his to tell. Crawling through a swamp, at one point he heard white-throated crakes calling, but he never saw them. Had the species been verified, it would have been a first count record for Honduras. But those birds and many others go unrecorded because they are not confirmed by more than one birder. On the other hand, another team did verify two Nutting's flycatchers, a first count record for Central America.

After hearing a recital of Mark's count, we felt a little guilty. Our count had been most civilized and leisurely. We had followed wide paths through the garden and only occasionally sunk into wet ground when we veered off the trail.

Not all of us had binoculars or bird guides, nor did the members of the other teams. Binoculars cost the equivalent of a month's salary for most Hondurans. Bird guides are an even bigger problem. To be properly equipped for birding in Honduras you need Ridgely and Gwyne's *Guide to the Birds of Panama, Costa Rica, Nicaragua, and Honduras,* which is available only in English. *A Field Guide to Mexican Birds* by Peterson and Chalif is useful as a supplement, especially since it does have a

One sighting of the spectacular keel-billed toucan is worth dozens of elusive warbler sightings in the making of a Honduran birder

VINCE MURPHY

BHL

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C. ALLAN MORGAN

With its gaudy, multicolored head, its creamy-white body, and its black flight feathers, the king vulture, above, is an unforgettable sight. One of these large tropical scavengers was seen on the last Honduran count.

Spanish version. But that edition costs the equivalent of $50 in Mexico and is not available in Honduras.

Another problem is the lack of standardized common Spanish bird names, which often makes it necessary for team leaders to translate the English bird names into their Spanish equivalents for Honduran participants. Is it any wonder that bird watching has not caught on among the general populace in Latin America?

The lack of binoculars and bird guides meant that for each sighting, the binoculars had to be shared and the field guides circulated among the team members. Although this slowed down our birding, it built up friendships and a sense of camaraderie. All of us were soon well acquainted and swapping bird stories between sightings.

Vida was endlessly patient, willing to spend time pointing out each species. She was not at all disconcerted by the three little boys who restlessly accompanied their novice birding parents, or by our tendency to divide up into smaller groups and discuss, for instance, the ecotourism possibilities in Honduras. In addition to five Hondurans, most of whom could speak some English, our group had one American super-birder besides Vida, along with one novice English and three novice American birders. So Vida was dealing with a mostly green group, one that ebbed and flowed and finally trickled away as the day progressed.

But not before we had some spectacular sightings. Seven keel-billed toucans sitting in one tree brought cries of *muy linda* (very pretty) from the Hondurans. We all stood, craning our necks for better views as we passed around the binoculars. In the midst of our excitement, two Honduran garden employees walked past, paused, and tried to figure out what we were looking at. One of the Honduran birders pointed out the birds, explained what we were doing, and handed them the binoculars. For the first time in their lives these men were looking at their country's birds through binoculars and, judging from their enthusiastic reactions, they might have been potential converts had they owned binoculars and field guides.

Our list was not particularly long at the end of the day, but for my husband and me the birds were mostly new species. Throughout my birding time in Honduras, however, I had been focused on seeing "our" tropical birds. Thus it was me who spotted a hooded warbler skulking in the underbrush and called it out to the others. Several of us slogged across the soggy grass to the shrubbery and finally "pished" the bird out.

"Good call!" the American super-birder said, and I swelled with pride. That was my sole contribution to naming a specific bird, though I did my share of locating and pointing out strange birds to the veteran birders in the group.

The only other familiar bird we saw in a sea of exotics—such as collared aracaris, citreoline trogons, bare-throated tiger-herons, Aztec parakeets, yellow-winged tanagers, Montezuma oropendolas, and white-fronted parrots—was a magnolia warbler. Neither of the migrant warblers matched in size or beauty the resident Honduran species, which points up the problem North Americans have in convincing Latin Americans to care about migrants. Many of their flashier native species are far more imperiled than ours, due, in part, to the still-lucrative bird trade. The resident Honduran birds are also easier to identify, particularly if you don't have binoculars. So those are the species we must help them protect if we want our southern neighbors to care about bird conservation. One sighting of the spectacular keel-billed toucan is worth dozens of elusive warbler sightings in the making of a Honduran birder.

The final results of the count were gratifying—

151 species, up from 135 in 1991 and 129 in 1990—for a total species count of 210 over the three-year period. Bird numbers also increased from 1,308 in 1990 to 7,473 in 1991 and 7,873 in 1992, although much of that was due to the 5,000 tree swallows counted in 1991 and 1992 at one of the lakes. Except for the ubiquitous species—331 great-tailed grackles, 198 black vultures, 103 brown pelicans, and 101 neotropic cormorants—most species were seen in groups of fewer than 60 individuals and many in groups of fewer than 10. Our team found the only Cassin's kingbird. Other teams contributed a single hairy woodpecker, yellow-bellied sapsucker, long-tailed hermit, green-breasted mango, sanderling, whimbrel, and king vulture, to name a few.

If the tree swallow numbers are added to the other migrant birds we counted, species that breed in North America accounted for most of the birds seen on the count, including 14 of the 16 warbler species and the most common oriole, the northern. American redstart remained the champion among the warblers, with 32 seen, followed closely by magnolia warbler, with 30. Common yellowthroat, yellow warbler, chestnut-sided warbler, and black-and-white warbler were the other warbler standouts.

Like any good CBC, this one also had its share of memorable sightings. In addition to the previously mentioned Nutting's flycatchers and Cassin's kingbird, the other verified rarities were a pair of elegant terns and a brown-hooded parrot.

More important than all the bird statistics, though, was the increasing number of participating Hondurans—at 40 the highest by far of the three counts—and the level of their enthusiasm. At the count dinner, held in the garden's open air restaurant, most participants ate absentmindedly while poring over their lists, paging through their field guides, or discussing the fine points of their own sightings.

The final tabulation took place the following morning, after a sleepless night for several of the team leaders and compilers. Pilar Thorn carefully reviewed each species on the list so that everyone would understand the results. Later in the program, each participant received an official diploma, signed by the government officials who sponsored the event, as well as Pilar, who had led the mini bird course. Then everyone posed for a group photograph.

But probably the most significant moment came when Manuel Rey, a young biologist and spokesperson for all the Honduran participants, presented a declaration that he and the others had drafted the previous night, proclaiming the value of protecting their country's natural environment. They planned to send it to appropriate government agencies and the media. This unexpected conclusion to the CBC was particularly gratifying to the American team leaders, since their aim has always been to use the count as a tool for environmental education. Perhaps the Hondurans would now become team leaders and organize CBCs not only in Tela, but in other bird-rich areas of Honduras.

BRUCE BONTA

Participants in the 1992 Tela Honduras Christmas Bird Count pose for a picture, above. After the event, the Hondurans in the group sent a declaration to their government proclaiming the value of protecting the country's environment.

No CBC account would be complete without a spectacular day-after sighting. Austin Stokes, one of the original Peace Corps volunteers who started the Honduran CBC, stayed on after his Peace Corps assignment ended to help organize the event. "Exhausted from four days with very little sleep, I was sitting slumped in a chair drinking a local Honduran brew," he told us. "Then Peter Nebel jumped up and grabbed his glasses. I'd seen the move a thousand times and was too tired to bother looking at another vulture. But I finally picked up my glasses and saw a flash of bright white, a quarter mile away and 400 feet up. Peter doesn't see red very well, but he knew what the lack of black on the wings meant. When I confirmed the bird's red throat pouch, we both knew it was a jabiru—one of the rarest birds in Central America. Seeing it was a wonderful reward for all the hard work and a great way to end the count." ■

Marcia Bonta is a freelance writer specializing in nature and outdoor subjects.

Remembering Ted Parker

by Don Stap

A gifted ornithologist has passed away, but his legacy lives on

In October 1990 I spent a weekend with Ted Parker at his home in Baton Rouge, Louisiana. It was the last time I was to see him. Ted had just returned from Bolivia, his first trip as the team leader of Conservation International's Rapid Assessment Program (RAP), an ambitious attempt to survey several of the world's least known tropical forests before the decade is over.

Ted was eager to talk about the trip, but first there was Saturday afternoon football. Victor Emanuel, founder of Victor Emanuel Nature Tours and one of Ted's early mentors, had also flown in for a visit. While Ted watched football, Victor got out his tape recorder to play the call of a zigzag heron he had taped recently in Ecuador. Little is known about the zigzag heron, and a tape of its call was a prized item. Victor was determined to show it off to Ted, football game or no.

As scores from other games came across the top of the television screen, Ted announced them. It was a strange conglomerate of sounds. Above the noises of the crowd and the announcer's play-by-play, Ted called out the scores, while the songs of South American birds played in the background.

"Look at that," Ted suddenly shouted. "Miami's only up by a touchdown over Cal State—wait a minute—hear that? It's a black-tailed leaftosser."

Victor looked surprised. He rewound the tape and played it again. The call of the zigzag heron was loud and clear.

"Right there. Hear it?" Ted asked, and Victor nodded. The black-tailed leaftosser was just audible among the cacophony of rainforest sounds in the background. Ted might just as well have looked out the window and pointed out a four-leaf clover 100 feet away.

Everyone who knew Ted Parker has such a story. His interest in birds, which began during his childhood in Lancaster, Pennsylvania, never abated for a moment. Before he graduated from college, Ted joined the first of many expeditions to South America sponsored by the Museum of Natural Science at Louisiana State University, where noted ornithologist John O'Neill recognized his special talents and encouraged him.

Though he never received an advanced degree, Ted became the world authority on neotropical birds, due in part to his uncanny aural memory: he knew more than 3,000 species of birds by their vocalizations. On more than one occasion, he rediscovered birds that no one had seen for years and that were presumed by some to be extinct, and once he discovered a new species of flycatcher when he heard the bird's call and realized it was a sound he'd never heard before.

News last August of Ted's death in a plane crash in Ecuador left bird watchers and biologists across the Americas stunned. On a RAP expedition Ted and world-renowned botanist Al Gentry were surveying an Ecuadorian cloud forest on a low-altitude flyover when the plane, lost momentarily in a cloud, hit the side of the mountain. Ted, Al, Ecuadorian conservationist Eduardo Aspiazu, and the pilot died in the crash. Three others survived, including Ted's fiancée, Jacqueline Goerck, who, despite a broken ankle and two fractured vertebrae, walked five hours through the forest before she found help.

"We have lost friends and colleagues whose biological and conservation knowledge is irreplaceable," Russell Mittermeir, president of Conservation International, told *The New York Times.* "Ted and Al knew firsthand what others only theorized."

Several weeks after the accident, friends of Ted Parker and Al Gentry came from all points on the compass to the U.S. Botanical Gardens in Washington, D.C., for a memorial service. Though sadness still prevailed, it seemed lightened somewhat by the luxuriant tropical flora of the gardens, and by the sounds that filled the air. During the evening, on speakers throughout the botanical gardens, you could hear the rainforest. This was Ted's legacy, and what he loved most: the voices of birds he had heard on muddy trails in Peru, Brazil, Ecuador, Bolivia, and everywhere else his Converse sneakers took him on hundreds of predawn walks in tropical forests. It was easy to pick out the ornithologists at the service: they were the ones trying to identify each new bird song they heard.

The recordings came from the Cornell Lab of Ornithology's Library of Natural Sounds (LNS), where since 1976 Ted had donated roughly 20,000 recordings (350 miles of tape), only half of which have been cataloged. Of the 5,100 species of bird vocalizations in the library, 1,611 were recorded by Ted.

"Ted turned this collection into the world's greatest," Greg Budney, curator of LNS, said recently. In addition to contributing his own recordings, Ted inspired and cajoled others to carry a tape recorder wherever they went. "You can trace just about every major LNS contributor in the last 10 years to a direct encounter with Ted," Budney told me.

In 1980, when he was a newly hired LNS technician, Budney was assigned to help Parker: each April, in between trips to South America, Ted spent two or three weeks at LNS, working 14 to 16 hours a day, seven days a week, reviewing tapes and cataloging vocalizations to be added to the collection. "Even though we were doing tedious work," Budney recalled, "Ted made it exciting, and I saw what a powerful tool sound was for understanding and identifying birds."

Before long Budney was hooked. In 1985 he went to Peru with Parker. "That trip changed my life," Budney said.

At a lodge north of Iquitos, on the Sucusari River, Budney got an extraordinary introduction to neotropical birds. One evening Parker heard the distant call of a nocturnal currasow, a large, secretive bird whose haunting song is almost all that is known about it. The call, which sounds like the night wind blowing over the mouth of a bottle, carries for miles through the jungle. No one had ever gotten close enough to make a good recording; Ted had made several unsuccessful attempts himself.

When the currasows started up that night, Ted grabbed his tape recorder and was off. Budney followed, as did Tom Schulenberg, Parker's co-leader for a tour group at the lodge. They walked into the forest, following the sound. Each time the birds stopped calling, they sat and waited. Hours later, they had come within a few hundred feet of the pair.

Though he could make a good recording at this distance, Ted wasn't satisfied; he wanted to get closer. The group crawled through the undergrowth. Again the birds fell silent. Ted stopped beneath a tree that he judged the sound had come from. Another 20 minutes went by, and then the currasows started up again almost directly above the group. The unearthly call boomed in their ears.

"That was one of the finest moments of my life," Ted said several months afterward. "We got back to camp at 4 A.M., about an hour before I was supposed to take the group out birding. But it was worth it."

Ted's contagious enthusiasm and his passionate commitment to learning about birds have immeasurably enriched the world of neotropical conservation. His recordings will be used by other biologists for decades to come; for starters, LNS plans to produce a series of educational tapes for Latin American biologists. Moreover, a number of parks that will protect important tropical forests are being planned as a result of the Rapid Assessment Program—one of them in Bolivia, at the site of that first RAP trip in 1990.

Recording the nocturnal currasows was only one of thousands of stories Ted had to tell, and he loved telling them. When Greg Budney told me about the evening spent tracking the currasows, I realized that I had also heard the story from Ted when I met him at the same lodge six months after Budney had been there.

In 10 days there, Ted showed me more species of birds than I had seen in a lifetime of occasional bird watching in North America. I remember how each morning he would roll out from beneath his mosquito netting into the early morning darkness, slip on his fatigues and tennis shoes, and wander over to the edge of the camp clearing. A towel draped around his neck to keep the mosquitoes off, he stood listening to the day's first bird songs trickle out of the forest.

KIM AWBREY

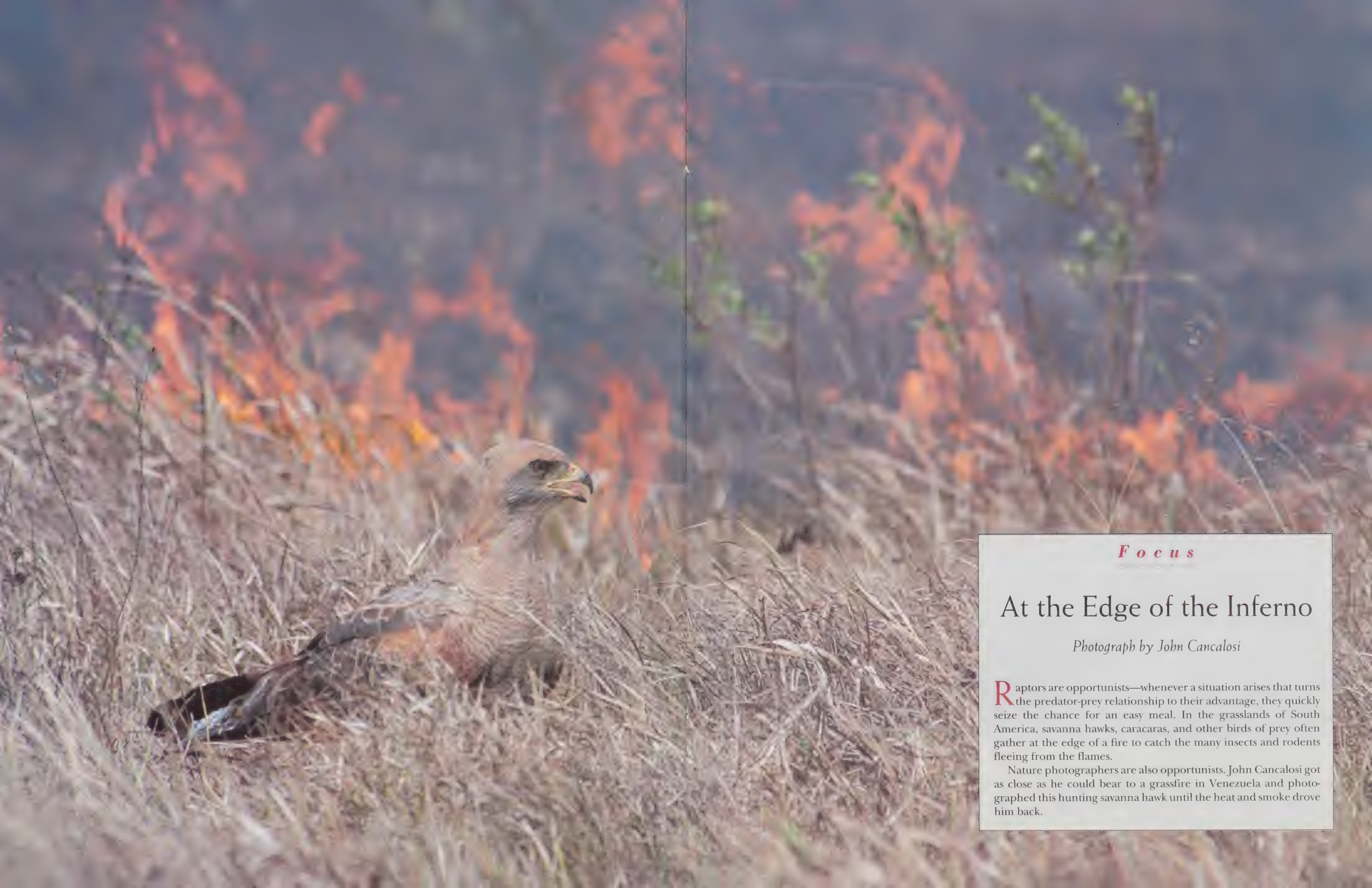
Ted Parker, center, and Al Gentry: They knew firsthand what others only theorized.

Although the rainforest had a powerful hold on my imagination as I walked the trails each day—its haunting emptiness and overwhelming fullness was a great paradox that both disturbed and excited me—Ted was usually impassive. The forest was his backyard. In the first waking moments on those mornings, his face grew expressive only when an interesting sound caught his attention.

Then a frown of concentration creased his brow, and he would squint his eyes quizzically until he was satisfied that he knew what he was hearing. After a minute or two of waking up this way, Ted would take another step, then, almost aimlessly it seemed, another—and suddenly, entering his element, the forest closing up around him, he was gone. ■

Don Stap is the author of A Parrot Without a Name, *an account of his travels in Peru with Ted Parker and John O'Neill. He teaches at the University of Central Florida.*

The Lab has established the Ted Parker Memorial Fund to develop training materials for Latin American biologists. Send your tax-deductible contribution to Ted Parker Memorial Fund, Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850.



Focus

At the Edge of the Inferno

Photograph by John Cancalosi

Raptors are opportunists—whenever a situation arises that turns the predator-prey relationship to their advantage, they quickly seize the chance for an easy meal. In the grasslands of South America, savanna hawks, caracaras, and other birds of prey often gather at the edge of a fire to catch the many insects and rodents fleeing from the flames.

Nature photographers are also opportunists. John Cancalosi got as close as he could bear to a grassfire in Venezuela and photographed this hunting savanna hawk until the heat and smoke drove him back.

To wading birds such as these snowy egrets and white ibises, Louisiana's acres of crawfish ponds probably look like enormous bird feeders. Note the breeding season finery (bright red skin on the ibises' legs and faces); by providing reliable food to breeding birds, farm ponds may be fueling a population expansion.

J.H. ROBINSON

CRISIS IN THE CRAWFISH PONDS

Crawfish farms are a boon to Louisiana wading birds, but how much longer will farmers provide a free lunch?

by Bruce Fleury

LAFAYETTE, LOUISIANA: The sun has barely risen, and already the egrets are gathering. A hundred wading birds line the banks of the pond, patiently stalking their prey. Mist curls from the surface of the water as the relentless heat and humidity of the Louisiana summer begin to build.

Will Bernard, jack-of-all-trades at the University of Southwestern Louisiana (USL) experimental crawfish farm, rides out along the levee in his three-wheeler. The birds rise in a pale cloud, their white wings reflecting the early morning sun. They circle the pond for a moment, then settle nearby in a recently plowed cornfield. They will soon recover their equilibrium and their appetite and return to feed again.

This scene is a familiar one in south-central Louisiana, where beleaguered crawfish farmers complain that herons, egrets, and ibises are plundering their crop. Faced with a similar problem, catfish farmers have received federal permits to shoot wading birds. Will crawfish farmers also be allowed to reach for a shotgun?

My interest in wading birds at crawfish farms began with a serendipitous discovery. As a graduate student working with Tom Sherry at Tulane University, I studied the effects of cattle egrets, an introduced species, on Louisiana's native wading birds. To my surprise, the egrets seemed to have had little or no effect on other wading bird populations. In fact, at a time when wading bird populations were declining elsewhere, Louisiana's populations were booming. We think this growth has been fueled in part by a feast of farm-raised crawfish.

NORMA JEAN GARGASZ (2)

When we examined the National Audubon Society's annual Christmas Bird Counts (CBCs) for Louisiana from 1968 to 1988, we found dramatic increases in several species of wading birds. Data from the U.S. Fish and Wildlife Service (USFWS) Breeding Bird Survey suggested that the state's resident breeding populations of wading birds also increased. These gains came at the same time that degradation of estuaries and habitat loss in nearby states such as Florida caused declines in other populations. We wondered whether the long-lived waders were relocating.

What could be attracting wading birds to Louisiana like a distant magnet? The answer may be abundant free food, spread like a banquet in neatly arranged, shallow ponds. To wading birds, Louisiana's crawfish and catfish farms must seem like enormous aquatic bird feeders.

Today is a big day at the USL experimental farm. Jay Huner, one of the state's leading crawfish experts and director of the USL Crawfish Research Center, is pulling the plug on his crawfish ponds. The harvest has just ended; crawfish get tougher as summer approaches, and people stop buying them. So the ponds are being drained, a common event around Lafayette at this time of the year. The crawfish will burrow into the soft soil, leaving behind "chimneys" of extruded clay. Sealed inside their burrows, they will incubate their eggs and await the spring rains, when they will emerge with their young.

Crawfish are ubiquitous in Cajun country. The distinctive chimneys dot the front lawns of suburban neighborhoods, and a mosaic of commercial ponds covers the countryside. Most aquaculture farmers raise the red swamp crawfish, *Procambarus clarkii.* Cajuns call them "crawfish," "mudbugs," "crawdads," or "creekcrabs"; calling them "crayfish" immediately marks you as an outsider.

By late afternoon Huner's ponds will be drained, and a small airplane will seed the pond bottoms with rice. This rotation of crawfish and rice—and sometimes soybeans—has been an economic boon to cash-starved Cajun farmers, bringing some relief from the relentless toll the sagging oil industry has taken on the local economy.

Crawfish are big business in Louisiana, and the pond-raised crop often exceeds the swamp harvest in both tonnage and economic impact. More than 115,000 acres of crawfish ponds were farmed in 1991, up from a mere 2,000 acres in 1960; meanwhile, profits exceeded $30 million dollars in each of the last three years. Historically the crawfish crop has been harvested and consumed in Louisiana, but in the past few years demand has risen sharply in other states and even overseas, where the small crustaceans are frequently offered as gourmet restaurant fare.

Wading birds relish crawfish. As the water level drops, the birds move into the shallow pools that dot the bottoms of Huner's ponds. In each pool dozens of crawfish scuttle, together with a rich mixture of fish, frogs, and aquatic insects. Great egrets, snowy egrets, and white ibises wheel in from all points of the compass, until nearly 800 wading birds are feeding in the ponds.

Crawfish farming is booming in Louisiana, thanks to a growing world appetite for the succulent mudbugs, and farmers don't want to share their harvest with a bunch of birds. Above right, C.J. Durand, co-owner of Teche Valley Seafood, hauls in traps; above left, crawfish are shelled by hand.

Crawfish ponds require the right type of soil as a substrate. It must hold water tightly and be readily compacted into retaining levees. If the soil is too porous, the pond slowly drains, leaving the vulnerable crop high and dry. If it is too friable, the levees crumble in the scorching summer sun. The best soils for aquaculture occur across the heart of southern Louisiana.

It is here, in and around the vast wetlands of the Atchafalaya and countless lesser streams and bayous, that wading bird colonies are also located. Birds prefer to nest where food has been plentiful in past breeding seasons. The Atchafalaya basin, a watery wilderness stretching over several hundred square miles, has historically provided wading birds and Cajuns with a bounty of fish, crawfish, frogs, and other choice prey.

This rich food supply fluctuates sharply from year to year with the whims of weather and water temperature and the amount and timing of the spring floods. Colonial wading birds have adapted to this unpredictable food supply. When Tom Sherry and I compared our CBC data with wild crawfish harvests, we found a good correlation between the size of the annual harvests and winter populations of crawfish-eating birds.

We found a much higher correlation, however, between wading bird populations and the total acreage devoted to commercial crawfish farms. Correlations between bird numbers and increases in farm acreage were particularly high for species such as white ibis and snowy egret, which consume large amounts of crawfish, and uniformly low for species such as cattle egret and roseate spoonbill, which rarely eat them.

The regularity with which crawfish ponds are managed makes them more predictable sources of food than natural foraging areas. The annual draining and flooding mimics the natural subtropical weather cycle, which alternates between wet and dry seasons. But the pond cycle is staggered slightly ahead of the natural cycle, so that farm crawfish can be harvested several months before the wild crop is available. Farmers flood their ponds in autumn, long before the spring floods that will signal the emergence of the wild crawfish. Pond-raised crawfish can be harvested from November to June, whereas the wild harvest usually peaks in April and May.

The farm harvest ends when the ponds are drained in late spring to midsummer. These drawdowns simulate natural drying in the swamps. As the water recedes, prey are concentrated in the shallows, a process that is especially important for species such as the white ibis, which feeds by touch. Drawdowns also provide large amounts of food for wading birds at a critical time in their annual breeding cycle—while they are raising nestlings and fledglings. The success of many species of wading birds in Louisiana may be due to the food available in aquaculture ponds.

The birds in Huner's rapidly draining ponds are feeding at a fantastic rate, stabbing, manipulating, and swallowing crawfish one after the other, eating three or more per minute. The late-morning heat shimmers over the unsheltered ponds. The tracks of raccoons, snakes, and other predators wind across the emerging mud.

Flocks of great and snowy egrets and white ibises stand almost toe to toe, while solitary tricolored herons stalk insects and mosquitofish darting along the water's surface. A few large crawfish escape, brandishing their formidable claws in the air as the birds approach, but most of the smaller crustaceans are quickly downed.

Is this feeding frenzy a major threat to crawfish farmers? Many farmers complain that their losses are significant, but no one knows the actual effect of wading birds on crawfish populations. The adult female crawfish and her broodstock are particularly vulnerable when they emerge from their burrows in the fall, and heavy predation then could significantly reduce the commercial harvest. But wading bird predation reaches its peak during spring and summer drawdowns. By then, most of the crawfish that will survive the dry summer are probably safe in their burrows.

The birds may even help some farmers—by thinning their crop. Overcrowded ponds produce small crawfish, a serious problem for an industry in which crawfish must reach a minimum length of about three inches to be marketable. By removing some crawfish throughout the year, birds may significantly improve the average size of the remaining crawfish.

Oxygen depletion, pesticides, and disease may pose a greater threat to the crawfish crop than hungry wading birds. For example, crawfish food—protozoans and algae—grows well in the warm, shallow, nutrient-rich ponds. But these same conditions can cause algal blooms that deplete the water's oxygen supply, resulting in massive crawfish mortality. Crawfish are also very susceptible to pesticides, which are heavily used on rice and other crops in central Louisiana; aerial drift and runoff from nearby fields can contaminate ponds. Bacterial diseases caused by such organisms as *Vibrio* and *Pseudomonas* may also take their toll.

Farmers cannot see bacteria, but they *can* see thousands of crawfish carried off every year in the beaks and gullets of wading birds. Farmers cannot shoot bacteria, but wading birds make large and tempting targets.

No one knows how many birds are illegally shot on fish farms. Although crawfish farmers can't legally kill wading birds, catfish farmers in Louisiana and adjacent states shoot thousands of birds every year under federal permit. In 1991, more than 13,000 birds were legally killed on fish farms; the total included 1,174 egrets and 2,643 herons. Fish farmers mainly target the longer-legged great egret and great blue heron, which can forage along the margin of the somewhat deeper catfish ponds.

C.C. LOCKWOOD

BRUCE FLEURY

Most farms are stocked with the red swamp crawfish, shown at left. By thinning the crop, wading birds may be helping, not hurting, farmers; crawfish grow larger in uncrowded ponds. The harvest ends as the summer heat builds; swamps dry up, ponds are drained, and crawfish dig in, throwing up mud "chimneys" that mark the entrances to their burrows, above.

These birds were killed under the U.S. Department of Agriculture (USDA) Animal Damage Control (ADC) program. ADC permits are jointly approved by the USDA, USFWS, and state wildlife officials. Permits are issued only for species not listed as threatened or endangered. The program's goal is to provide relief for farmers who have unsuccessfully tried to remove birds with conventional, nonlethal techniques.

These include fireworks, "screamer" shells, stationary and moving dummies, foot and pickup patrols, and propane cannons. Farmers have also tried various types of netting systems, with mixed success. But even the best systems require a significant investment, in an industry that operates on a thin profit margin. Birds quickly become accustomed to most scare tactics and are remarkably adaptable in their foraging tactics. Some wading birds, for example, have learned to plunge-dive like pelicans to avoid nets stretched over deep ponds.

The ADC's involvement in bird problems at fish farms has been controversial from the beginning. By treating herons, egrets, and other carnivorous birds as agricultural pests, the ADC puts itself at odds with other state and federal programs that work to increase habitat and provide protection for these species, to say nothing of the hackles the program raises among conservationists and bird advocates.

So far, only one ADC permit application has been filed by a crawfish farmer, a request to kill white pelicans. The permit was denied; the ADC will not issue permits for crawfish farms unless

ROB CURTIS

Watching a white ibis gulp down valuable stock, above, a crawfish farmer might be tempted to reach for a shotgun—and a U.S. Department of Agriculture program might let him. Treating crawfish-eating birds as agricultural pests puts the USDA at odds with other state and federal programs that protect these birds.

farmers can prove they have suffered measurable losses. And so far, no one has. If further research proves that bird predation is hurting the crawfish harvest, however, crawfish farmers may follow the lead of catfish farmers, and hundreds more of Louisiana's wading birds could be legally shot.

The solution to wading bird predation is not to be found in the barrel of a gun. "I think fish farmers are wasting a lot of time and money killing birds," says Randall Snodgrass, director of wildlife policy for the National Audubon Society. "The birds are winning."

In January 1993, Audubon Society representatives joined crawfish and catfish farmers, wildlife biologists, and representatives from the USDA and USFWS in New Orleans for a two-day symposium that aimed to develop mutual understanding between farmers and conservationists. The symposium was cosponsored by the Audubon Society and the National Aquaculture Association (NAA), and was held in conjunction with the NAA annual conference.

According to Snodgrass, both sides have cause for concern. Fish farmers are worried about losing money—they're afraid that more birds will mean more problems. Conservationists fear that more birds will be killed as the industry continues to grow. "The [U.S. Fish and Wildlife] Service continues to issue permits with no idea where it will all end," says Snodgrass. He believes the goal of the ADC should be to find an effective, nonlethal way to keep birds out of the ponds.

Mike Freeze, the current president of the NAA, agrees that farmers and conservationists have a lot of mutual ground. "If bird populations would remain stable, we could live with that," says Freeze. "Farmers are realistic; they expect to suffer some losses. What has them most concerned are the trends in bird populations."

Wading bird populations are growing rapidly; so is the importance of the crawfish crop in Louisiana's fragile economy. As a result, the conflict between farmers and wading birds is likely to get much worse. We need more research to determine the relationship between the reproductive success of wading birds and the availability of pond-raised crawfish; we also need to measure the effects of avian predators on commercial harvests.

I hope to examine some of these questions in my dissertation research. I'll compare the amount of food available in natural and farm pond systems, and I'll measure how hard birds must work to find food in each system. In the process, I'll try to get a better idea of how much marketable crawfish the birds eat. And I'll look at how wading bird colonies have changed—in their size, composition, and location—as crawfish ponds have become important parts of the ecological landscape.

At the USL crawfish farm, the still heat of late afternoon is shattered by the roar of an airplane. The bright yellow, single-engine crop duster circles the pond as the pilot judges the stiff breeze that stirs the oaks and willows in the nearby groves. Finally he turns the plane and banks toward the surface of the ponds, skimming the surface and scattering rice seed over the exposed mud. With each pass of the plane, hundreds of herons rise swiftly into the air, circle silently, and settle back to feed once more.

The arrival of the crop duster signals the end of the farmer's harvest and the birds' free lunch. By the end of the week, a carpet of green rice seedlings will cover the drying mud. The crawfish that have survived the avian gauntlet will be safely tucked away underground, patiently awaiting the autumn flooding that will flush them from their burrows. ■

A former science reference librarian, Bruce Fleury is working on his Ph.D. at Tulane University. He is also deeply interested in the ecology and evolution of dinosaurs and recently wrote Dinosaurs: A Guide to Research *(Garland Press, 1992).*

Further Reading

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Critics' Corner

SOUND PLAYBACK PACKAGE

Price: $315.00 ($350.00 for nonmembers)
Available exclusively from the
Crow's Nest Birding Shop.

Many of us are already familiar with the advantages of compact discs (CDs) over tapes and records. In most instances, CDs offer improved sound, the ability to quickly locate specific cuts on a recording, and a medium much less prone to wear and scratches. Until relatively recently, though, the virtual absence of bird sound recordings on CD gave birders little reason to abandon their portable cassette players in favor of digital technology. But today, with the Peterson and National Geographic bird song guides available on CD and the promise of new releases to come, there is no longer any reason to wait.

To this end, the Cornell Lab of Ornithology has assembled some goodies to help usher birders into the digital age. The Sound Playback Package is a great tool for bird watchers—from novices to serious listers—who want to increase their knowledge of bird sounds.

The package consists of a Denon DCP-70 portable CD player with remote control, headphones, a small external speaker/amplifier, an AC adapter, a carrying case, and cables to connect the CD player to the external speaker and your home stereo system.

I field-tested the package during the height of southern Wisconsin's spring warbler migration using the *Peterson Field Guide to Eastern Bird Songs*. My first thrill came when I wanted to check on a loud, jerky song I'd heard in the backyard. Was it a Connecticut warbler? Finding the right spot on a cassette would have involved a tiresome back-and-forth, rewind and fast-forward ordeal. Instead, I selected track 29 using the remote control, then held the SEARCH FORWARD button down to scan forward, stopping when the digital counter told me I'd reached the point where the Peterson booklet said the Connecticut's song began. No, it's not instantaneous, but you can locate and move between tracks a great deal more quickly than you can with a cassette. And yes, it was a Connecticut warbler.

Incidentally, the recently released National Geographic CD *Guide to Bird Songs* puts each species on a separate track, instead of bundling several species on each track, as on the Peterson CD. Punch in the track number and immediately hear the species you selected—you don't have to search within the track. This format lets you use the Denon's programming feature; for example, enter the track numbers for American robin, rose-breasted grosbeak, and scarlet tanager, and you hear an instant comparison of these sound-alike species.

In the field, I appreciated the Denon's light weight and the thoughtful design of the carrying case, which has an extra pocket for additional CDs, a small notebook, or even a field guide. The sound quality through both the headphones and the small external speaker was generally excellent, and the latter conveniently mounts onto the carrying case with Velcro strips.

The external speaker will be especially useful for professionals involved in bird research or censusing

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who need to be able to attract or detect particular species. For general birding purposes, though, my advice is to use the headphones and leave the extra speaker at home or in the car. Remember that the excessive broadcasting of songs and calls can wreak havoc among territorial and nesting birds.

—Todd Highsmith

NIKON F4S CAMERA

As I write this review I have two cameras placed side by side in front of me: one is a state-of-the-art Nikon F4S, featuring autofocus and automatic exposure control, while the other is its rugged, no-frills predecessor, a Nikon F that I've owned since the 1970s. Both were designed to fit the needs of professional photographers, and both can produce fine pictures. The question is: Do the many improvements that Nikon has made to its F model line over the years, culminating in the F4S, make it a better tool for bird photography? The answer is a resounding yes.

Not all photographers will want to rush out and trade in their existing equipment for an F4S—it is very expensive. But it also is quite a remarkable camera. I had a unique opportunity to see how the F4S would function in opposite climate extremes—tropical heat and frigid cold—within a three-week period. I spent a week in Costa Rica and returned to New York just in time for the "Great Blizzard of '93."

Humidity is a real problem in the tropics. In Costa Rica, some days the air was so muggy that my camera would be drenched in condensation the second I walked outside. I had to keep wiping the fog off the outside of the lens and eyepiece, but no moisture penetrated the inside of the camera. The heat and humidity did not appear to have any effect on the electronic or mechanical functions of the camera; all the pictures I took in Costa Rica turned out properly exposed and in focus.

When I got back home to Upstate New York, I took the camera outside to get some shots of the blizzard. The snow was several feet deep in places and a cold wind blew constantly. The F4S functioned well through it all (the only problem I had was holding the camera steady while I was shivering). At close to zero degrees Fahrenheit, the camera was still clicking away with no apparent difficulty. But what impressed me most about the F4S during the snowstorm was how well the camera's built-in exposure control system evaluated the lighting situations.

I set the camera on fully automatic matrix metering, which divides the image into five separately metered sections, compares the brightness and contrast in each section, and compensates for the extremes between them. This system is excellent with tough lighting situations, such as backlit or bright, highly reflective subjects. It had no trouble determining the right exposure for the snow—all the photographs I took in the blizzard looked great (at least exposure-wise).

TIM GALLAGHER

But you do not have to use the fully automatic exposure mode with this camera. You can switch to manual mode, where you set the f/stop and the shutterspeed; or aperture priority, where you set the f/stop and the camera sets the shutterspeed; or shutter priority, where you set the shutterspeed and the camera sets the f/stop. In short, the F4S exposure control system is as manual or as automatic as you want it to be. The same is true of the autofocus mechanism. If you would prefer to focus the lens yourself in certain situations, you can switch the camera to the manual focus mode. Or use a manual focus lens; the F4S will accept virtually all Nikkor or Nikon Series E bayonet-mounted lenses produced since 1967, though pre-autofocus lenses will only work in the manual and aperture-priority modes.

One of my favorite features of the F4S, from a bird photography standpoint, is the whisper-quiet, built-in motordrive. I've always liked motordrives because they're fast and efficient so you're always ready for the next shot. But sometimes, when you're photographing a particularly shy bird, a motordrive can spook your subject. I've solved this problem in the past by turning off my motordrive and using my camera's thumb lever film advance. The F4S does not have a thumb lever, but it really doesn't need one—this camera is quieter than any mechanical advance or motordrive camera I've ever used, and it's capable of shooting 5.7 frames per second.

I also like the feel of the camera, with its molded, hand-filling grip on the side. The various adjusting knobs and levers are conveniently located—basically in the same positions as they were on earlier F models: shutterspeed knob and shutter release button on top; mirror lockup and f/stop preview button in front. Looking through the viewfinder, two LCD panels indicate the light meter's operation and other data, including the film-frame number. The die-cast aluminum chassis of the F4S makes it very rugged, but not light—the camera weighs in at a hefty 3 pounds, 2 ounces, *without* a lens.

In conclusion, the Nikon F4S is rugged, dependable, and capable of taking excellent pictures in the tough conditions that bird photographers often face. This camera will not be for everyone, however. It is heavy and expensive—the suggested retail price of the F4S is a whopping $2,590, not including a lens. But this fourth generation in the venerable Nikon F product line is a great camera that should enhance the skills of most photographers.

— Tim Gallagher

THE BIRDIN' OF KINDNESS

by Pete Dunne

I'm a reserved person. I take pride in my ability to face disappointments stoically. But when I opened the third straight birthday card displaying an insipid cartoon canary and the announcement: "A little bird told me it's your birthday," I put my head in my hands and wept.

It's not that I mind getting older. Heck, I've been doing that all my life. What vexes me is the unmindful cruelty of nonbirders. Ever since it became known that I'm a bird watcher, nonbirding friends and relatives have been demonstrating their support by showering me with bird-related junk.

"Why another bird card?" I said to my open hands. "Why not a card depicting some incontinent old drooler welcoming me to the 40s or some scantily clad vision promising earthly delights beyond the reach of my years."

I'm normal, I wanted to scream. I pay taxes . . . cut the lawn . . . cheat on my diet, just like normal people. Why don't I ever get anything but bird stuff?

What is it about bird watching that makes mothers think that the ugliest lamp in the history of porcelain will make a splendid gift, so long as the lampshade boasts an impossible assortment of tanagers, chickadees, and warblers standing in the snow? What is it about our avocation that turns tasteful, decor-sensitive people into the gift-buying equivalent of roller derby fans?

In anticipation of my upcoming birthday, I inventoried our living room and took stock of my unwanted stock to make room for a new wave of kiln-fired kiwi toothpick holders, bluebird of happiness paperweights, music boxes that play "Yellow Bird," and coaster sets emblazoned with all of the birds that John J. Audubon managed to bend into a figure eight.

Standing upon my deerskin thunderbird rug, I cast my eye over an accumulation of wealth whose most prominent treasures included a throw crocheted by my sainted grandmother, depicting a bird-draped St. Francis of Assisi; a beer stein shaped into the likeness of a kori bustard; a turkey cleverly constructed out of porcelain vegetables; and a woodstove humidifier that looks like a muscovy and warbles like a canary.

Bear in mind that these are the keepers. The stuff we've relegated to the attic would make even the most tasteless Victorian pack rat long for the release of curbside pickup.

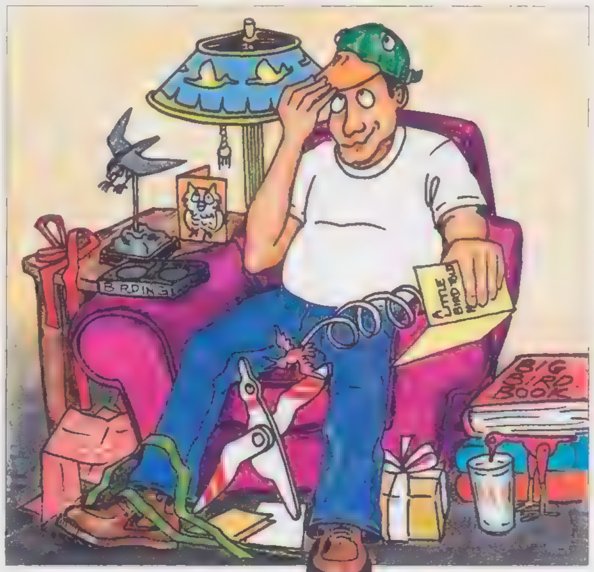

ILLUSTRATION BY JEFF SIPPLE

Of course, not all the bird-related stuff I get is useless or tasteless. But what's a person supposed to do with four copies of "Gone Birding"? (I don't even own a VCR.)

Last Christmas (via my brother's secretary) I even received a gift copy of my own most recent book, *Feather Quest.* "Merry Christmas to my birding brother," the inscription read. "I saw this in the storefront and thought of you."

I know I'm not the only birder singled out for persecution. I have a naturalist-writer friend named Diana whose friends also convey their affections with an avalanche of avian knickknacks. After the holidays we compare notes—a sort of birding bric-a-brac big day competition.

"So how many goldfinch/painted bunting/cardinal dish towels did you get this year?"

"Four."

"Beat you there. I got five. How about salt and pepper shakers with bluebirds feeding nestlings on them?"

"Two."

"Oooh, tied score. What about lacquered pieces of driftwood boasting hand-painted kinglets?"

"If you let me count the goldcrest along with the ruby-crowned and golden-crowned kinglet, three."

I used to think the books that ended up in bargain basement bins were publishing blunders—books whose sales simply couldn't realize an optimistic overprinting—but no longer. Now I believe that all those half-price coffee table bird books are printed *specifically* to get people who know nothing about birds to buy them for friends who do. And now I've got an attic full of them.

"Oh why?" I pleaded to my hands, "can't I just once receive a normal present . . . a juicer . . . a bread maker . . . whatever happens to be in vogue this season? Why am I condemned to bear the brunt of so much misbegotten kindness?"

A single envelope remained on the table, one addressed in colored crayon, bearing the brand of a favorite niece. Bravely I opened the flap, withdrew a homemade birthday card, and stared at the lovingly drawn illustration. An illustration that replicated the outline of a child's hand. An illustration that resembled not the expected bird, but beyond all hope a long-limbed, long-necked turtle.

"Oh blessed child," I whispered, as tears flooded my eyes. "Favorite of my heart. You can count on a big fat check from Uncle Pete this year."

Only then did I realize that "Happy Birthday" was written upside down. When righted, what had been a long-limbed turtle became just another turkey. ■

CYNTHIA BERGER

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CORNELL LABORATORY OF ORNITHOLOGY
For the Study and Conservation of Birds

LIVING BIRD

For the Study and Conservation of Birds

SPRING 1994

SWAINSON'S HAWK NEST BY TIM GALLAGHER

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For the Study and Conservation of Birds

A Publication of the
Cornell Laboratory of Ornithology

LIVING BIRD

SPRING 1994 VOLUME 13 NUMBER 2

Greetings from Sapsucker Woods

I wonder what people driving past thought we were doing. Standing at the edge of an open field with a dozen scopes lined up in front of us, we must have been an odd sight. Perhaps passersby thought we were a firing squad, or maybe some strange paramilitary group in training. Chilled by an icy drizzle, the six of us stood there pointing our high-power optics at the same feathered lump at the top of a utility pole.

What were we watching? A rare vagrant from a faroff land? Wrong. The bird that had us all transfixed was nothing more than a common European Starling. You see, we were working on the latest Lab of Ornithology equipment review—this time comparing spotting scopes—and were desperate for a bird of any kind to look at. The starling turned out to be a perfect subject. It takes a great scope to bring out the subtle feather detail of a dark-colored bird on a gloomy day . . . especially when you're shivering.

We spent many more days trying out the scopes. Sometimes we even got to use them on some really interesting birds, such as the Northern Goshawk that came barreling past above us as we stood in front of the Lab pond watching ducks. We swung our scopes up in unison and got a great look at the bird: a beautiful adult female. You'll find the results of our scope review on page 26 of this issue.

On another subject, we are pleased to welcome a new contributing editor to *Living Bird.* Mel White will now write our "Flying Field" column, which appears twice a year in these pages. A native of Arkansas, Mel is a full-time freelance writer who caught the birding bug as a child from his mother. You may remember the essays he wrote on the California Condor and the Golden-cheeked Warbler, or his feature on the ecological restoration of the Cache River. Many of you sent letters praising Mel's writing. We're glad to have him aboard.

— Tim Gallagher
Editor-in-Chief

Cover: A Trumpeter Swan sits on its nest near Yellowstone National Park. For more than half a century, a feeding program in a valley west of the park has provided food for the birds in winter. Now hundreds of them have lost the will to migrate. To read more about the swans' plight, turn to page 20. Photograph by Jeff Foott.

Right: The Joe DiMaggio of the bird world, a Great Blue Heron cruises over Fenway Park. For more on birds and baseball, turn to page 16. Illustration by Jack Unruh.

Back Cover: Harbingers of warm weather, Tree Swallows are a welcome sight after a long, cold winter. Photograph by David Welling.

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts. © 1994 Cornell Laboratory of Ornithology.

Printing by Cayuga Press, Ithaca, New York.

Color separations by Brodock Press, Utica, New York.

Printed on recycled paper.

Letters

KIM BACON

BIRDHOUSE A WINNER

My son Bill (seven years old) made a Downy Woodpecker birdhouse using the plans provided in *Living Bird* ("A Basic Box for a Basic Need," Spring 1992). He was able to complete the entire birdhouse himself (with Dad helping to read the directions), using a handsaw, drill, sander, and screwdriver.

Bill entered his birdhouse in the California State Fair "Build a Birdhouse" competition sponsored by Chevron and the National Audubon Society. He won first prize in his division (nine years old and under).

Needless to say he was quite excited (as were his mom and dad). The judges praised his birdhouse for having the correct size hole, ventilation, easy access for cleaning, and lack of tree-damaging fasteners.

After the fair ended in September we put the birdhouse up in our backyard. We are looking forward to hosting some woodpeckers soon.

Kim Bacon
Sacramento, California

MORE SHELL-DROP SPECULATIONS

I lived on a rocky beach on Puget Sound from 1982 to 1986 and enjoyed watching the gulls dropping clams to break the shells. What fascinated me was that the crows did it, too.

Somehow it was more exciting to me that crows dropped shells than that gulls did, because I thought the crows had to have learned it by observing the gulls, whereas I had the idea that the gulls were doing it instinctively.

Katharine Thayer
Tillamook, Oregon

NEVER SAY NEVER

In "Murder Most Fowl" (Autumn 1993), John Alcock states that Brown Boobies "absolutely never rear two offspring to the age of fledging. At least one of the chicks always dies."

From May 1991 to July 1993 I was the wildlife biologist for the Johnston Atoll National Wildlife Refuge, southwest of Honolulu, Hawaii. Several hundred Brown Booby pairs nest there every year, and once in a while—perhaps twice each season—I saw a pair with two very large, healthy offspring. It is rare, but it does occur.

Donna O'Daniel
Payson, Arizona

YOU MADE ME WHAT I AM TODAY

Living Bird is my favorite birding publication. It probably contributed most to my transformation from backyard bird enthusiast to avid twitching maniac. It may have been the first letter from the Lab asking for pledges for the World Series of Birding. I pledged five cents a bird. The follow-up letter describing the antics of the team was worth far more.

I remember thinking how great it would be to join a Big Day team someday. To be able to identify birds by ear. To be considered a "good" birder.

The dream came true in 1991. I was asked to join an established team. We tied for 7th place. In 1992 I helped put together what was probably the first all-women's team. We came in 12th.

I've been meaning to write a thank-you note for years.

Ellen S. Short
Rockland, Delaware

We welcome letters from readers.
Address letters to: The Editors, *Living Bird*, 159 Sapsucker Woods Road, Ithaca, New York 14850.

BirdNews

COWBIRDS UNDER SCRUTINY

The Nature Conservancy and the U.S. Department of Defense (DOD) made an unlikely but effective team when they cosponsored a recent workshop on cowbird management. More than 150 ornithologists and resource managers discussed the latest research on this destructive nest parasite at the North American Workshop on the Ecology and Management of Cowbirds in Austin, Texas, last November.

"Up till now, the connection between forest fragmentation and increased cowbird parasitism was kind of a truism in the scientific community, but the data were shaky," says Scott Robinson, a biologist with the Illinois Natural History Survey and one of the workshop's program chairs. "Research presented at this meeting has solidified that connection."

By fragmentation, Robinson means the cutting up of continuous forests with roads and housing developments. Brown-headed Cowbirds lay their eggs in other birds' nests; they prefer open habitat, but roads let them penetrate to the heart of the forest, where many migratory songbirds nest.

Why is the DOD interested in cowbird management? Many military bases include large tracts of undeveloped land that have become significant wildlife habitats. The DOD is taking its stewardship seriously.

SEXUAL SEGREGATION

During the winter, Dark-eyed Junco populations in cold climates have many more males than females; in warmer areas, females outnumber males. Rebecca Holbertson of the State University of New York at Albany thinks a behavioral difference causes this curious segregation.

In laboratory studies described in *The Condor* (vol. 95: 580-87; 1993), she found that females seem to start migrating earlier than males—an average of 12 days earlier—and keep migrating after males have stopped. In other words, females travel longer, so they end up farther south.

How did Holbertson measure migration in the lab? Birds that are ready to migrate tend to hop around during the night. She placed juncos in cages with electronic perches that automatically kept track of the nocturnal bouncing.

Other explanations for junco sex segregation have included evidence that males are larger than females and can better withstand cold temperatures; that males are more aggressive than females and may push them out of winter territories; and that north-wintering males may be positioning themselves for an early return to the spring breeding grounds.

Holbertson says that any one of these situations might have exerted selective pressure leading to the gender difference in migratory behavior. Now, she says, this difference is by itself sufficient to keep the sexes separate in winter.

NEW BIRD FOR BRET

Lab associate Bret Whitney and his colleague Jan Pierson have discovered a new bird species, as yet unnamed, in Madagascar. Whitney's talent for identifying birds by the sounds they make led to the discovery.

Whitney and Pierson, both guides for the tour company Field Guides Incorporated, first noticed the bird in November 1992 in a humid, ridgetop forest near a wildlife reserve. It was Whitney's first visit to the island nation, so he was sorting out the new voices in the dawn chorus; one song didn't seem to match any of the "birds in the book." By recording and replaying the mysterious song, the pair lured a warblerlike bird into view. "We were in shock," says Whitney. "We knew we were staring at a bird unknown to the scientific world!"

Scientists think the drab-green bird, which seems to be fairly common at high elevations in eastern Madagascar, belongs to the family *Sylviidae* (Old World Warblers). This large group of small, confusingly similar birds can be as baffling to birders as North America's *Empidonax* flycatchers. Tom Schulenberg of Chicago's Field Museum, who is studying the new bird's genetic material, says, "Right now, all we know for sure is that it's definitely a new species."

Whitney's recording of the new species will be archived at the Lab's Library of Natural Sounds.

ARCTIC PEREGRINE PROPOSED FOR DOWNLISTING

The U.S. Fish and Wildlife Service (USFWS) has proposed removing the Arctic Peregrine Falcon from the endangered species list. A final decision is expected by September 1994.

The falcon made the list as a threatened species in 1970; DDT and other pesticides probably caused the decline of this subspecies of *Falco peregrinus*, which breeds on the Arctic tundra. After the U.S. Environmental Protection Agency restricted the use of DDT in 1973, populations slowly rebounded.

Arctic peregrines make up 75 percent of all the Peregrine Falcons in North America, says USFWS biologist Ted Swem, who adds, "It's especially exciting that these birds recovered completely on their own, without a captive breeding program like the one in the lower forty-eight. This means that the restored populations come from the same genetic stock as the original populations."

TIM GALLAGHER

A newly banded Arctic Peregrine Falcon, above, is about to be released to continue its migration.

COMPILED BY CYNTHIA BERGER

WORKING FORESTS: HYPE OR HOPE?

HELEN LONGEST-SLAUGHTER, NATURE IMAGES, INC.

The Working Forests of Maine

In our Autumn 1993 issue, we published an article entitled "The Working Forests of Maine." The author, Laurel Kornhiser, described the work of John Hagan, a biologist at the Manomet Observatory who is studying how timber industry practices affect neotropical migratory birds nesting in the forests of Maine. That article prompted this exchange:

"Working Forests" Message Deceptively Upbeat

by Stephen Ells

BOOTS GARRETT

"The Working Forests of Maine," by Laurel Kornhiser, is a stunning bit of PR. I think the article misses the forest for the trees. It seems designed to lull the reader into believing that current clearcutting practices in the Northern Forest benefit neotropical migrants. What concerns me is not the research itself, which sounds interesting, but the way sweeping and reassuring conclusions are drawn from its first-year results to create the overall impression that all's well with neotropical migrants as they breed in the industrial forests of Maine. The linkage between the facts and this reassuring opinion is missing, however. The problems are far more complex.

During my years as the U.S. Environmental Protection Agency's Director of Environmental Review for New England, I became aware of both the development of the industrial forest in Maine and the large aerial pesticide spraying programs. I also noted the illusory protection for the environment that federal pesticide laws provided. I feel continued concern about the effect of the following forest practices in Maine:

- For the past 20 years, at least 120,000 acres of forest per year have been clearcut or nearly clearcut—in an already heavily altered environment.
- In addition, up to 120,000 more acres of forest per year have been fragmented, both before and after the passage of the Forest Practices Act. In other words, an amount of forest perhaps equal to the amount actually clearcut has been severely degraded by edge effect, "island" isolation, road construction, and cutting practices that, though technically not clearcutting, are equally harmful to forest habitat for breeding birds.
- Modern tree harvesting equipment is startlingly efficient. It is capable of quickly reducing a large forest to a scarred and barren field that is unlike any natural habitat and is slower to regenerate.
- Ecological preserves and corridors are woefully deficient.
- Management practices such as monoculture plantings and the regular use of herbicides by most companies (up to 80,000 acres were treated per year in the 1980s) eliminate deciduous trees and favor fir, which is the preferred food of the spruce budworm.
- Spruce budworm outbreaks resulted in a 14-year program (during the 1970s and 1980s) in which pesticides were sprayed over an average of 1.5 million acres of Maine annually. Initial spraying to contain the outbreak started in 1954, with DDT the pesticide of choice until 1967. In one year at the peak of the outbreak, three-and-one-half million acres of Maine forest and nine million acres of Canadian forest were sprayed. The spraying in Canada continues even now; the spraying in Maine has been suspended until the next inevitable and industry-enhanced outbreak.

Are these the forest practices of which *Living Bird* says, "What's good for timber companies can also be good for birds"? To me these practices sound like warfare on the ecosystem. Clearcutting results in a massive simplification of the biodiversity of the affected environment. It eliminates many species and much structural diversity. It's not clear that the forest has the ability to recover within the reasonable future.

Furthermore, in the new industrial forest, timber companies are likely to follow clearcutting with further harmful management practices. They will replace the original multi-aged forest of mixed spruce-fir and northern hardwood with an even-aged stand of herbicide-selected fir, which will be cut before it attains the diversity and characteristics of a mature forest. In other words, after a clearcut, trees may grow back but the forest probably won't.

After a clearcut, trees may grow back, but the forest probably won't

I agree with researcher John Hagan that other practices—the increased amount of edge in a mosaic of 250-acre clearcuts, the breaking up of large tracts into a clearcut checkerboard, and the loss of mature forest habitat—are also real issues for the survival of forest species. But the solution discussed in the article (permitting even larger clearcuts) neither expresses the full range of options nor reflects recent history. Prior to 1990, when no maximum cut size existed, the timber industry did not take the opportunity to set aside large reserve tracts. Indeed, in many cases, they simply cut down everything from horizon to horizon. The real problem is not the 250-acre limit on clearcutting; the problem is clearcutting itself and the industry's appetite for it.

Perhaps the menu of solutions suggested in the article was constrained by the study's purpose: to "recommend management techniques that might mitigate these effects *without compromising the forest's economic value or ecological balance.*" [This quotation is from another article by Laurel Kornhiser that appeared in the Winter/Spring issue of the *MBO Quarterly.* Emphasis added.]

Conceivably, however, a full range of solutions might include banning or severely limiting clearcuts or near-clearcuts, limiting road construction, requiring more conservative management practices and only sustainable cuts, eliminating pesticide and herbicide applications, and most important, setting aside true, large, carefully designed, permanent wild reserves and effective corridors.

I share Dr. Hagan's hope, which he expressed in another article, that Maine's Northern Forest can be an important breeding habitat reservoir for neotropical migrants, and I look forward to the results of his study and discussions of how that objective can be achieved. But how can forest practices that have shown such a bias for the primacy of economic gain be trusted to protect environmental values?

We Need Data to Make Decisions

by John Hagan

REBECCA HAGAN

Mr. Ells is concerned that Laurel Kornhiser's article lulls the reader into believing that current clearcutting practices are a benefit to neotropical migrants. We at the Manomet Observatory (MO) understand the conservation issues surrounding neotropical migrants as well as anyone. Manomet hosted an international symposium on the topic at Woods Hole in 1989; this meeting is widely credited with bringing national attention to this problem and has led to an ambitious federal, state, and private cooperative conservation program called *Partners in Flight.* Such cooperation is a rare but much-needed approach to environmental problem-solving.

The purpose of the study described in the article is very specific: to understand the habitat requirements of Northern Forest bird species, and to evaluate the landscape effects of industrial forestry on birds. Besides clearcutting practices, Mr. Ells raises a plethora of concerns about Maine's forests, including overharvesting on a large scale, application of pesticides, and plantation forestry. These topics are very important to me as well, and I share many of his concerns. But they are beyond the scope of our current study. In this letter I will elaborate on points for which I may offer insight.

One of Mr. Ells's primary concerns is clearcutting. There is no question that a clearcut is unsightly, whether large or small. The more relevant question for environmentalists should be, "Is clearcutting ecologically bad?" The answer is, yes and no. We need to dispense with the notion that "good" or "bad" can be uniformly applied to a particular forest practice. The challenge is to maximize the "good" and minimize the "bad." To do this we must document and examine all aspects of an issue. When we have the facts, we can form an opinion.

Data from my study in northern Maine show that avian diversity is enhanced by industrial forest practices, including clearcutting. This statement is based on 774 10-minute counts of birds in all habitat types, from clearcuts to mature hardwood and softwood. Many species prefer the early stages of forest growth that result from clearcutting, including the Chestnut-sided Warbler, Mourning Warbler, Magnolia Warbler, Nashville Warbler, Common Yellowthroat, and Lincoln's Sparrow, to name a few. Clearcuts, and the scrubby habitats that follow them, are not the biological deserts many people think they are. The increase in early successional habitats as a result of clearcutting in the last 20 years has caused dramatic increases in these species in our study area. With the exception of the Lincoln's Sparrow, these are all neotropical migrants, some of which are declining at significant rates in the Northeast. All of these species are also ones that bird watchers enjoy. It is reasonable to suggest that clearcutting is working to offset regional or national declines in these species.

At the same time, clearcutting or timber harvesting by any means comes at the expense of mature forest habitat, which is used by many other neotropical migrant species, such as the Blackpoll Warbler, Bay-breasted Warbler, Red-eyed Vireo, Ovenbird, and Black-throated Blue Warbler. Some of these species are also showing declines. The question of whether this species "exchange" is good or bad was not addressed in the *Living Bird* article.

The important question is whether the creation of early successional habitat is compromising the abundance and health of forest species. This is a difficult question to answer because the word "compromising" has different meanings for different people. If Ovenbird abundance decreases by 50 percent in our study area but viable populations remain, is that being "compromised?" Or does a 5 percent loss of abundance mean the species is compromised? Before we can answer this question, we need to know how the abundances of the various early and late successional species change as a result of industrial forestry. These are the data the Manomet study is collecting. The public can then use these data to address the definition of "compromised."

Given that clearcuts are important for many species, consider the alternatives. Assuming that evicting the timber industry from Maine is not a pragmatic solution, selection cutting might be encouraged. If a paper mill needs 2,500 cords of wood (about 100 acres of forest) to supply one Sunday edition of the *Boston Globe,* it can either harvest 100 acres as a clearcut, 200 acres as a 50 percent selection cut, or 400 acres as a 25 percent selection cut. A 25 percent selection cut might look better than a clearcut, but it would affect four times as much forest area as the clearcut method. Three hundred acres of forest *would have remained intact* (physically and ecologically) if the needed volume had been harvested as a clearcut.

This comparison is important because intact, undisturbed forest is a commodity of concern in the North Woods. Large tracts are important to many forest-dwelling species, such as the Ovenbird. Harvesting 400 acres as a 25 percent selection cut would require a much larger and more complicated road network than the 100-acre clearcut. Roads fragment forest, as Mr. Ells has pointed out.

To retain the maximum amount of undisturbed forest, larger clearcuts may be merited in situations where erosion and related environmental impacts can be effectively controlled. "Larger" does not mean "more." The principle outlined above also applies here. If harvesting can be spatially consolidated, more undisturbed forest will remain. To this end, a single large cut is preferable to many small clearcuts of an equal total area. This is a matter of geometry, not values or opinions. Moreover, large clearcuts can grow back into large, unfragmented tracts of forest. Though such stands are called "even-aged," they develop valuable vertical diversity because some tree species grow fast and others slowly. Our data show that such stands, if allowed to mature, can be important, bird-rich habitats.

It is important to distinguish between the terms "clearcutting" and "overharvesting." They are not synonymous. While I may disagree with Mr. Ells on the acceptability of clearcutting as a harvesting technique, I share his concerns about overharvesting, whether as clearcutting or selection cutting. It is not clear to me that current rates of harvesting in Maine are ecologically and economically sustainable at the century scale. It is clear that pressures on the forest will continue. Our study is trying to understand the effects of landscape geometry on bird populations now, so that we can prepare for the future by catalyzing different harvesting regimes, if needed.

My data show that avian diversity is enhanced by clearcutting

To create these solutions we need to work with the timber companies to understand the implications of their activities. There is much we don't know about the effects of industrial forestry on the populations of birds and other organisms, and supposition will not be productive. We need data, and we need the cooperation of the timber companies to collect it. We need access to their land and forest inventory data. And we need an open dialogue with the companies so that we can discuss our recommendations in the context of real-world economics. At MO we are working with the timber industry as *independent ecologists who have no constraints on dissemination or interpretation of the data.* Over 80 percent of the funds supporting our project come from private nonprofit foundations with no connection to the timber industry. The remaining 20 percent comes from a nonprofit research affiliate of the timber companies. Our conclusions will be available to the industry, government, and the conservation community alike. Whether the industry takes action based on the recommendations resulting from our study remains to be seen, but without these data and insights, how can a dialogue begin? How will change ever occur?

The other concerns that Mr. Ells raised include pesticide use, the conversion of hardwood forest to softwood spruce-fir forest, plantation forestry, and over-efficient harvesting equipment. I am not qualified to address these points in detail. The timber industry limits insecticide use to periods of spruce budworm outbreaks. We don't adequately know what impact these pesticides have on insect-eating bird populations, but I share Mr. Ells's concern.

The conversion of sites from hardwood to softwood is also a concern I share. The timber industry is shifting the relative abundance of these forest types in Maine because most paper mills prefer softwood. They use herbicides to inhibit hardwood growth, thereby accelerating the growth of softwoods. This procedure tends to speed up forest regeneration, at the expense of early successional bird species and those that specialize in mature hardwood forests. For me, the important question is not whether conversion to softwoods is an acceptable forest practice, but rather how much conversion would have to take place to put Northern Forest ecosystems in jeopardy.

Finally, the most efficient harvesting machine I know of is the K-220 Feller Forwarder. With this machine a single worker can harvest about 15 acres per day. With its long boom, the machine can reach out and cut trees over a 60-foot-wide swath, a process that results in much less soil and understory vegetation disturbance than "less efficient" methods. "Efficient" is synonymous with neither "overharvesting" or "ecologically damaging." The machine is not the problem, but rather how industry and society use it to exploit the natural resource.

We all need to realize that the forest products industry in Maine is supplying a product that the public demands: paper. Some companies are more environmentally responsible than others, but the industry's "appetite," as Mr. Ells puts it, is a reflection of the public's appetite, and our current throw-away mentality. If we regulate the economic practicality out of the timber industry in Maine, the companies (or other companies) will continue to supply the product of demand and simply switch the timber harvest to another region or country. What uses of Maine's forests might then follow? Second-home development? Shall we simply shift the natural resource burden to, say, Central America, where many of our neotropical migrants winter, or to the southeastern United States, where many of our temperate migrants winter? Such action would be irresponsible, arrogant, and narrow-minded. We need to develop solutions to the problems we have helped create. One of those solutions relates to silvicultural practices. Manomet is seeking ways to improve silviculture for the benefit of Northern Forest ecosystems, keeping in mind that both people and wildlife have a stake in their future.

Finally, as Mr. Ells indicates, the goal of our study in Maine is to recommend management strategies that would mitigate adverse effects of forestry while maintaining the forest's economic viability as well as its ecological diversity. Economic considerations are not a constraint, as Mr. Ells states. They are a challenge. Whether we can reach our goal is as yet unknown. But until the environmental community, industry, and more broadly, society at large recognize the interdependence of environmental and economic goals, we will continue to squander our opportunities for maintaining the biological richness we have today. ■

Stephen S. Ells was founding director and chairman of the Conservation Law Foundation and, for the last decade, the EPA's director of environmental review for the New England states.

John Hagan is a senior scientist at Manomet Observatory. His research focuses on integrating economic and ecological goals in forest management, both in temperate and tropical forests.

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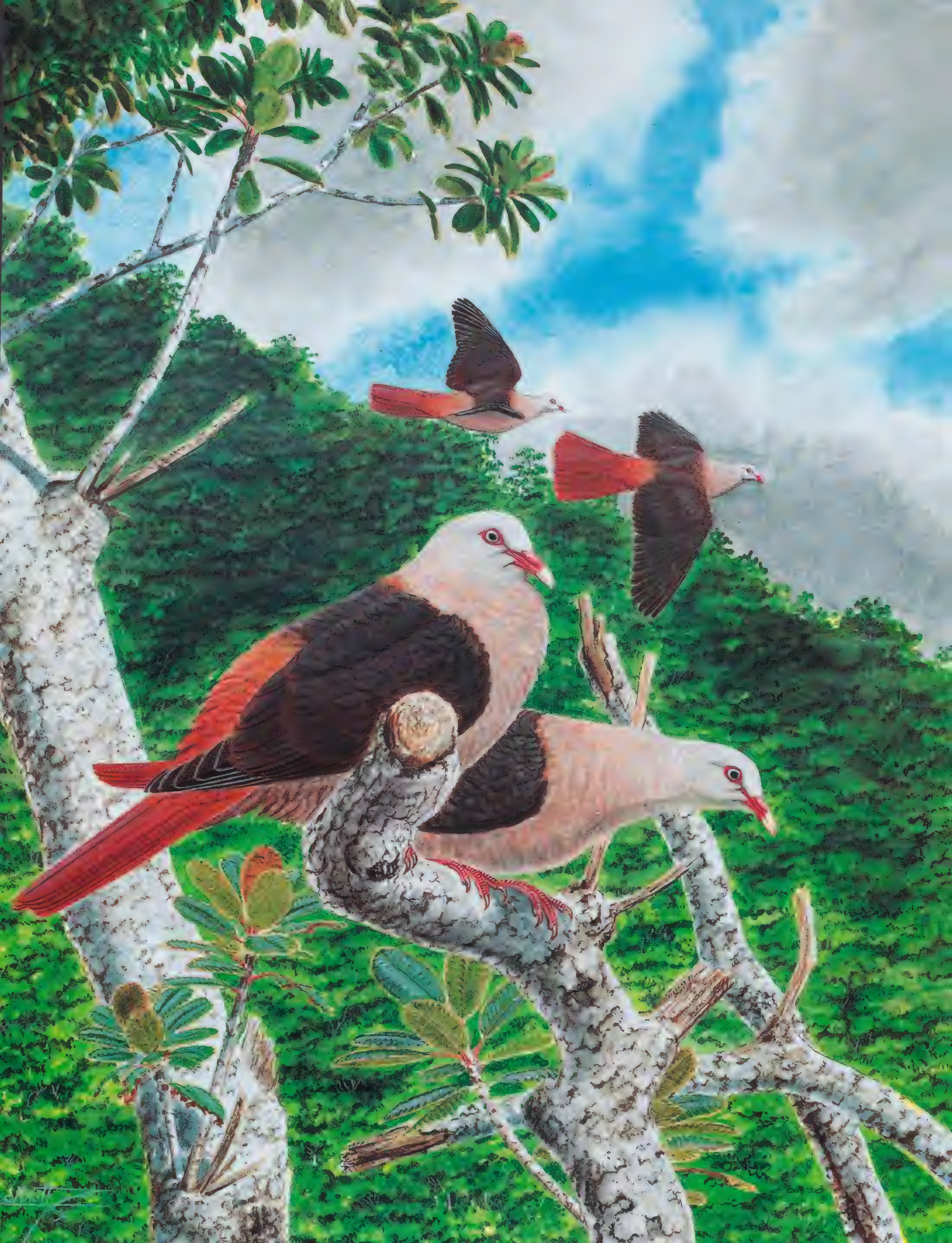


Foul Fowl

by Stanley A. Temple

Like skunks and monarch butterflies, some brightly colored birds may be advertising their noxious qualities

Ornithological field work has its risks. My studies of raptors have taken me to remote wilderness areas, and I have occasionally worried that I might fall from a cliff, or that my boat might capsize in frigid Arctic waters. But the first time my life seemed seriously at risk, I was hardly engaged in a dangerous activity. I was watching a Pink Pigeon as it quietly ate fruit on the Indian Ocean island of Mauritius.

Hunters on the island of Mauritius avoid the colorful Pink Pigeon, left; tradition says it tastes terrible. The bird itself eats a varied diet of leaves, buds, flowers, seeds, and especially fruits—including some that humans find inedible. Could this bird be harboring plant poisons, benefiting from the protection they confer?

The pigeon, one of the last survivors of this endangered species, plucked and swallowed several fruits from a small, native shrub that I didn't recognize. Then it flew to a nearby tree and rested for some time in the late afternoon sun. At last it flew to its evening roost, to join the 27 other pigeons that made up the entire wild population of this beautiful species.

After the pigeon departed, I collected some fruits from the shrub so I could identify them later. Then I made an unfortunate decision—I tasted the fruit. I had already sampled other fruits

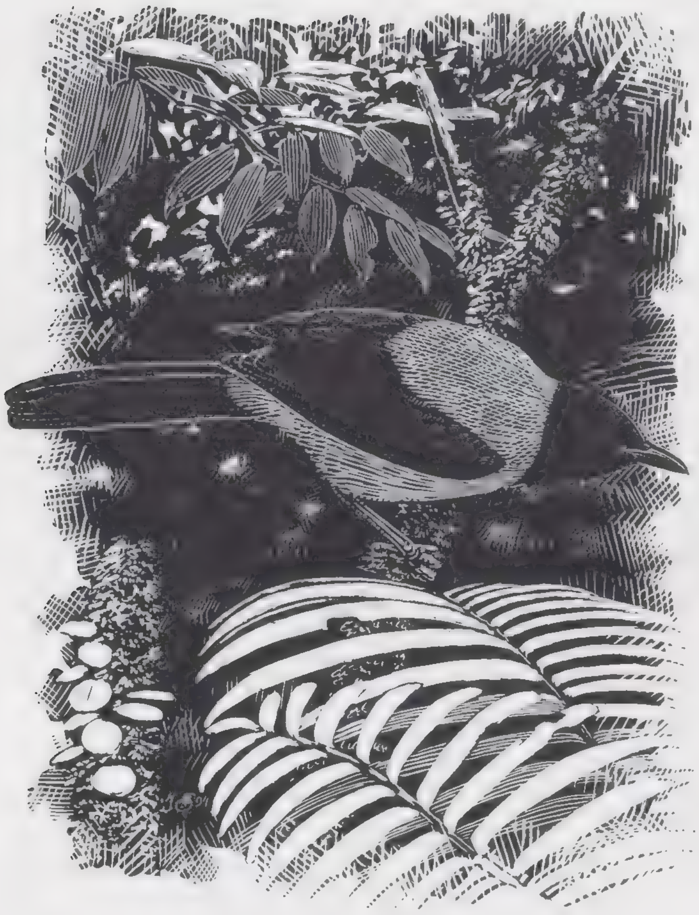
ILLUSTRATIONS BY JOHN SCHMITT

the pigeons ate, to see whether they preferred a particular flavor.

Like many of the other fruits, this one tasted very bitter when I touched my tongue to it. Within minutes I felt a growing numbness in my mouth and throat. I panicked as I realized that the fruit was toxic.

How could the birds eat poison fruit? In a flash an explanation came to mind. According to Mauritian folklore, people who eat the meat of Pink Pigeons become deathly ill. Indeed, the bird's reputation for inedibility probably saved it from being hunted to extinction like the Dodo and other pigeon species formerly found on the island.

Pink Pigeons ate toxic plants, like the one I'd just licked, but suffered no ill effects. Instead, the toxic chemicals remained in the pigeons' flesh and poisoned unsuspecting hunters, who told gruesome accounts of their illness and avoided the bird thereafter. The same mechanism works for monarch butterflies. When they feed on milkweeds, they incorporate chemicals called alkaloids into their bodies. These alkaloids are toxic to birds, and the illness that follows a monarch meal conditions the unfortunate bird to avoid the butterflies in the future.



The media had a field day over the 1992 discovery of "the world's first poisonous bird," the Hooded Pitohui, above, whose feathers and flesh contain the same chemical that makes poison-dart frogs so deadly. Author Stan Temple thinks many other birds also use chemical defenses. Northern Flickers eat ants and also rub them on their feathers in a behavior called "anting," at right. Perhaps the formic acid in the ants makes flickers less palatable to predators.

As my mind reeled, I frantically began to describe the episode in my journal. If I died, at least others would know why. But the symptoms gradually subsided, and I realized that I wasn't going to die. I knew the subject of toxic birds would be worth further study, though. I also learned an important lesson: never taste an unfamiliar fruit, even if birds can safely feed on it! The one I had tasted was in the same family as the Christmas cactus, and this group of plants is known for the alkaloid chemicals they produce.

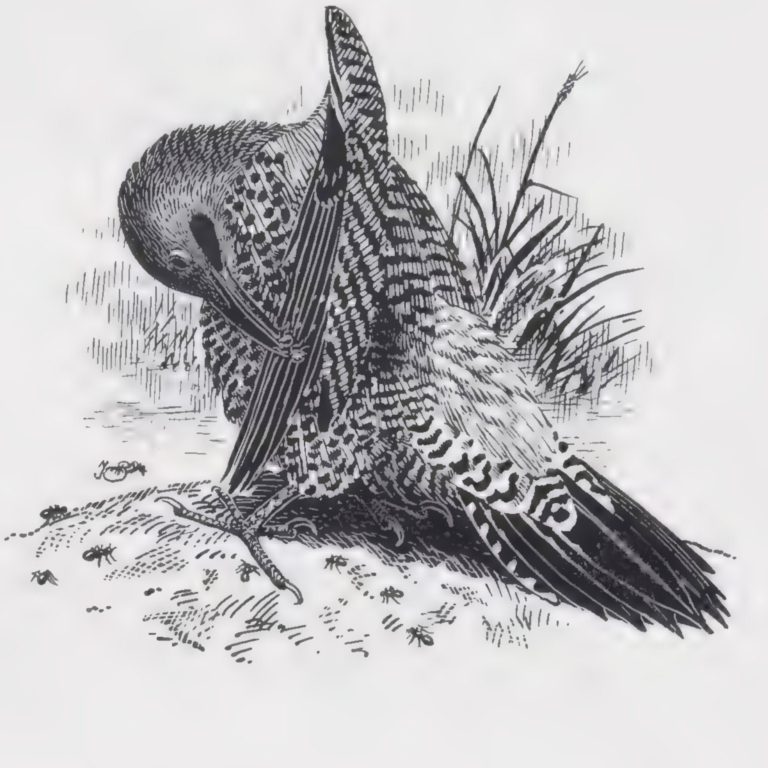
Why hadn't I made the connection between toxic plants and toxic birds before taking the fateful taste? Only a few years earlier, while I was a graduate student at Cornell University, I'd taken a course in chemical ecology, and my term paper actually dealt with toxic birds. The Mauritius Pink Pigeon is not unique among birds for its chemical defense mechanism—written accounts of poisonous birds go back as far as the Bible. Numbers 11:31-34 describes people in Israel becoming sick after eating migrant quail. Scientists conjecture that the quail may have fed on poisonous plants while migrating. The toxins were benign to the quail but poisonous to human beings.

The scientific literature holds dozens of convincing anecdotal accounts of other bird species that are either poisonous or distasteful to human beings. Many of these accounts come from ornithologists who tried to make a meal from a bird they had collected and skinned to prepare as a specimen. The most thorough inventory of distasteful birds is the work of Hugh B. Cott, a British scientist who in the 1940s systematically sampled the palatability of over 200 birds and their eggs, representing some 57 avian families.

Cott verified that some birds and their eggs are unpalatable to human beings. His unusual taste test included such unlikely and, as he found out, disgusting meals as Hoopoes, woodpeckers, and vultures. Cott reported a tendency for unpalatability to be correlated with the conspicuousness of a bird's plumage: the least palatable birds were the most conspicuously colored. The African Black Cuckoo, with its distinctive black-and-white plumage, was one of the most distasteful.

Cott's work attracted relatively little scientific interest, except as an example of ornithological esoterica. Then, last year, Jack Dumbacher of the University of Chicago rekindled interest in toxic birds when he published an account of toxicity in the Hooded Pitohui, an orange-and-black songbird from New Guinea. When he accidentally licked his hand after handling pitohuis, Dumbacher experienced numbness not unlike what I had felt when I tasted the fruit eaten by the Pink Pigeon. He and coworkers isolated a toxic chemical from pitohui feathers and flesh and identified it as the same alkaloid that makes poison-dart frogs so toxic.

Dumbacher attracted unexpected attention because earlier work by Cott and others had largely been forgotten. The media accounts, in publications ranging from *The New York Times* to *People* magazine, announced incorrectly that the



pitohui was the world’s first and only toxic bird.

Although accounts of poisonous birds are amusing and perhaps provide a warning to those who might try to eat unfamiliar wild birds, they also suggest something much more interesting. Like monarch butterflies and scores of other animals, some birds may have actually evolved chemical defenses—inadvertently discovered by unfortunate human consumers—to protect themselves against their more important natural predators, especially birds of prey. Again, anecdotal accounts are suggestive.

I am a falconer, and occasionally one of my trained Merlins captures a bird that was not the object of the hunt. I remember how one Merlin reacted in disgust to the taste of a Red-headed Woodpecker that it had captured. That Merlin never subsequently pursued black-and-white birds.

I’ve seen similar reactions in wild raptors. For example, wild falcons clearly find Northern Flickers distasteful; they pick at the flesh and flick aside most of what they take into their beaks. These raptors may learn from experience that flickers are unpalatable. During fall migration, when falcons and flickers move along the Atlantic coast together, the slow-flying flickers should be easy prey—they’re conspicuous in open habitats that offer little escape cover. Yet adult falcons normally pass up opportunities to capture flickers. Only inexperienced young falcons regularly pursue flickers—and they don’t seem to relish the meal that follows a kill.

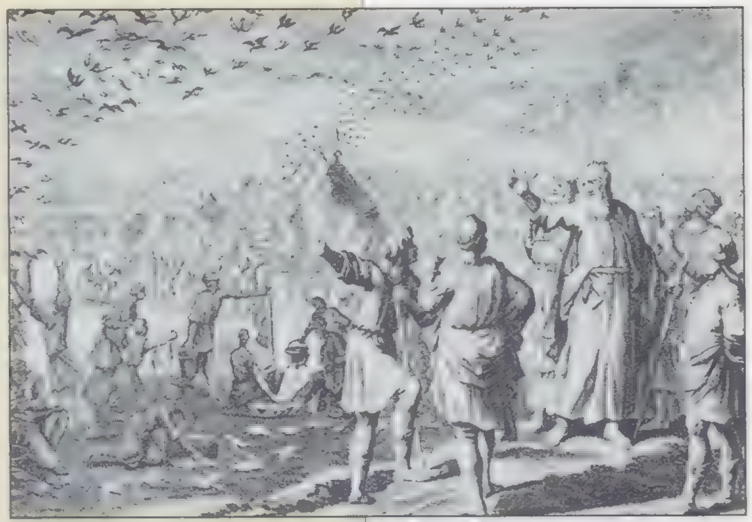
Why do flickers taste yucky? The answer may be ants, which the birds both eat and rub on their feathers in a behavior called “anting.” Some ants contain noxious-tasting chemicals, such as formic acid. The bad taste doesn’t protect ants from predation by flickers, but it may protect flickers from predation by raptors who have already had one nasty-tasting meal. Flickers may even have a way to help ensure that raptors don’t make a mistake. The characteristic yellow-and-black flight feathers and white rump-patch are very conspicuous to a raptor attacking from above and behind; they may serve to warn (or remind) the predator of how unpalatable this bird is.

Many animals that use chemicals to defend themselves advertise their unpleasantness with a predictable combination of characteristics. They flaunt conspicuous colors such as red, yellow, orange, or black-and-white; show bold patterns such as high-contrast spots; and engage in conspicuous behaviors, such as gathering in large groups, moving in a way that attracts attention, and using postures that show off the bright color patterns. These characteristics are well suited to warn experienced predators of the consequences of an attack.

A Plague of Quail?

Then a wind went out from the Lord, and it brought quails from the sea and let them fall . . . all around the camp, and about two cubits deep on the ground. So the people worked all that day and night and all the next day, gathering the quails; . . . and they spread them out for themselves all around the camp. But while the meat was still between their teeth . . . the Lord struck the people with a very great plague. So that place was called Kib’roth-hat • ta’a • vah, because there they buried the people who had the craving.

— Numbers 11:31-34



This excerpt from the Bible may be the earliest known historical record of “poisonous” birds. The verses suggest a God with human emotions, annoyed by Israelites who whined for meat instead of manna while they wandered in the desert. He sent them quail; but people who ate the meat became ill, and some even died. Scientists conjecture that perhaps flocks of migrating quail, passing through the Middle East en route from Europe to Africa, had feasted on berries or seeds that were toxic to humans. The engraving above, from *Historien des Ouden en Niewen Testaments,* depicts the Israelites gathering quail as they fall from the sky.

Scientists have coined a term, “aposematism,” to describe this combination of chemical defense and warning signals. Most of the scientific research on aposematism has dealt with insects and other invertebrates; some other examples of aposematic animals include skunks, the brightly colored poison dart frogs found in neotropical rainforests, coral snakes, and some coral reef fish. The flicker fits the pattern of aposematism very nicely, with its yellow (or red in the western race), black, and white coloration and the boldly displayed, high-contrast white spot on its rump.

Many other birds show what seem to be aposematic features. Consider the Cock-of-the-Rock, a spectacular orange and black bird that makes itself very conspicuous as it gathers in communal display areas. Could this species be warning predators that it is chemically defended? I think the chances are good that the answer is yes, and that the warning is directed toward highly visual raptors rather than toward color-blind mammals and reptiles, which rely more on the sense of smell or hearing to find prey. Many of the conspicuous signals birds use are ideal for warning raptors but probably less effective with mammalian or reptilian predators. For example, wing patches, tail spots, and rump patches are ideally positioned to be seen by a pursuing raptor.

CRAIG MOKMA

This Red-headed Woodpecker's boldly contrasting colors could be sending a signal to bird-eating raptors: "Back off! I taste bad!" Many animals known to be noxious flaunt black-and-white patterns or yellow, orange, or red—think of skunks and coral snakes.

If you look at birds in all their diversity, fruit-eating birds as a group seem to be especially conspicuous and perhaps aposematic. Could these birds be using chemicals borrowed from the plants they eat to defend themselves from predators? Birds such as the Pink Pigeon might be doing this—if they are able to retain the chemicals in their bodies, and if they can tolerate the toxins better than raptors can. By storing chemicals obtained from the food they eat, these birds would avoid the complex and energy-demanding process of making defensive chemicals from scratch inside their bodies.

For that term paper on toxic birds I wrote while I was a graduate student at Cornell, I tried to find out whether fruit-eaters are more likely than non-fruit-eaters to have typical aposematic features. I pored over illustrations in field guides and scored plumage traits for hundred of birds.

Bold colors seem to make a bird dangerously conspicuous to predators. But the dangers of visibility could be outweighed by one of several advantages. For example, bright colors might help a bird defend a territory, attract a mate, or recognize an individual of the same species. I wanted to see if any of these advantages could explain why potentially aposematic traits should be so prevalent in fruit-eating birds.

If a bird uses conspicuous signals as a part of its arsenal for defending a breeding territory, the conspicuous signals should be used primarily in the context of territorial disputes. They should be hidden at other times, to avoid making the bird more vulnerable to predators. The usually hidden red epaulets of Red-winged Blackbirds or the spectacular crests, usually concealed, of some flycatchers are clearly used in this way. I didn't find any correlation between these normally hidden signals and any particular diet.

Similarly, if a bird uses conspicuous signals to attract a mate, it should use the signals only in a mating context, and not display them at other times. For example, grouse often flash colorful skin patches or feathers during their courtship displays. Again, I didn't find any correlation between birds that used these types of signals and a diet of fruit.

Finally, if closely related birds use conspicuous signals to recognize members of the same species, the signals should be prevalent in taxonomic groups in which several close relatives have overlapping ranges. I found no correlation between the frequency of bright colors or bold plumage patterns and the number of coexisting species in a family.

What I did find was that fruit-eating birds were five times more likely than other species to have boldly conspicuous colors that contrasted with their normal background. They were also three times as likely as other birds to be gregarious, according to the life history accounts. If fruit-eating birds are defended by chemicals in their diet, this might explain why these birds are so brightly colored, even when it seems to make them dangerously conspicuous to predators. They might be aposematic.

Although birds are among the most colorful and conspicuous animals, ornithologists so far have not embraced aposematism as an explanation for many of the spectacular visual signals that birds send to the outside world. Indeed, no unified theory exists to explain the enormous variety in birds' plumage. Future research will almost certainly provide evidence that many birds are sending signals with meanings far more complex than we realize. In the case of brightly colored and boldly patterned plumage, the message may be in the eyes of the beholder. What seems beautiful to the human eye may be a disgusting warning to predators. ■

Stanley A. Temple is the Beers-Bascom Professor in Conservation at the University of Wisconsin in Madison and a member of the Lab's administrative board.

Further Reading

Hallowell, Christopher. "The Hooded Pitohui's Poisonous Secret." *American Birds,* Winter 1992.

TIM GALLAGHER (3)

The Mighty Sapsuckers Ride Again!

Spring is here . . . Can Big BirdWatch '94 be far behind? On May 14, 1994, big day teams from throughout the land (and as far away as Britain) will be locked in combat in New Jersey, vying to see who can find the most bird species in the state within 24 hours.

We'll be there, too. For the eleventh year in a row, our resident big-day team will join the fray. Last year the Sapsuckers hit the 200 mark for the first time. Will they be able to top that score this year? Is it remotely possible that they may even beat all the other teams? Anything's possible!

Won't you pledge your support for the Sapsuckers? Watch your mailbox for details.

Big BirdWatch '94

From the beaches to the cities and all the fields, swamps, and woodlands in between, the Sapsuckers, above, scour the Garden State for birds. At right, "On to New Jersey!" Lab staffers launch last year's team.

OF BIRDS and BASEBALL

by Ted Levin

Double your pleasure at the old ball game

Watching baseball and watching birds require similar skills. Both employ patience and imagination, sometimes deep thought; both progress slowly, appear boring from a distance, but are punctuated by bursts of joyous activity; neither is hampered by time. I love the vicarious thrill I get when a base runner breaks for second or a flight of geese crosses in front of the moon, and if these events occur simultaneously, which once happened at Shea Stadium, I feel something close to ecstasy.

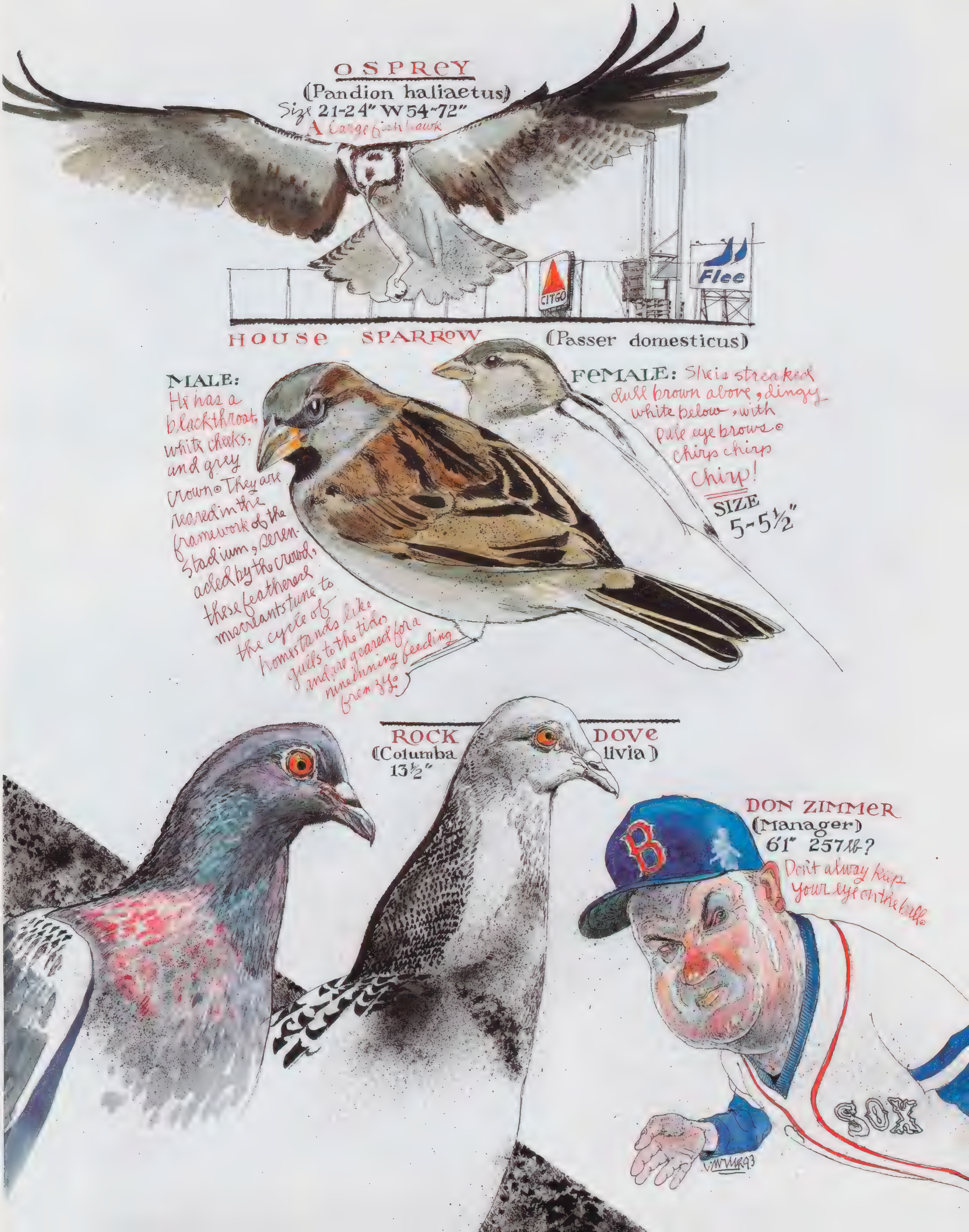
In my life there is no clear line between nature and baseball. I'm a nature writer and photographer, and when I break away from my work, I track baseball. But I never really break away. A few Aprils ago, for instance, while 46,000 people watched Jim Abbott lose his major-league debut to the Seattle Mariners, I watched a dozen Vaux's Swifts catch white moths above Anaheim Stadium, pirouetting like a gaggle of disenfranchised shortstops. The small, sooty-colored swifts were a life bird for me, a notch on my North American list, a bird I had hoped to see migrating across the Mojave Desert. It was the first life bird I ever saw at a major-league stadium (though I once recorded two "lifers," an Inca Dove and a Great-tailed Grackle, at a fast-pitch softball game in Tucson).

On another occasion, one youthful summer night in the South Bronx, I watched a Barn Owl ply invisible currents high above the bleachers, bathed in the glow of Yankee Stadium. A ballpark owl is a rare event—as rare, perhaps, as slow-footed Mo Vaughn stealing second base. Maybe rarer.

Over the years I have discovered that major-league ballparks are good places for bird watching. With very few exceptions, they hug migration flyways—the Atlantic and Pacific coasts, the Great Lakes, the interior rivers. Ohio River Purple Martins surge above Cincinnati's Riverfront Stadium. At Veteran's Stadium in Philadelphia, it's Barn Swallows; at the Oakland Coliseum, Violet-green Swallows. But Boston's Fenway Park—nestled along the Charles River and the Atlantic Ocean—may be the best ballpark in America for watching birds.

That is one reason why I am here with my son Casey, who is five and at his first major-league game. I tally birds and watch the Tigers and the

ILLUSTRATIONS BY JACK UNRUH



OSPREY
(Pandion haliaetus)
Size 21-24" W 54-72"
A large fish hawk

HOUSE SPARROW (Passer domesticus)

MALE: He has a black throat, white cheeks, and grey crown. They are reared in the framework of the stadium, serenaded by the crowd, these feathered miscreants tune to the cycle of homestands like gulls to the tides and are geared for a nine inning feeding frenzy.

FEMALE: She is streaked dull brown above, dingy-white below, with pale eye brows. Chirp chirp Chirp!

SIZE
5-5½"

ROCK DOVE
(Columba livia)
13½"

DON ZIMMER
(Manager)
6'1" 257 lb?
Don't alway keep your eye on the ball.

Red Sox take batting practice. Four grackles, as purple as twilight, fly from the John Hancock sign above the center-field bleachers as we walk toward the box-seat railing along the third-base line. While I record the grackles, our first species of the day, my son is mesmerized by Fenway's famous 37-foot-high left-field wall, a wall, I've told him, known as the Green Monster. "Papa," he says. "It's big, but not as big as a real monster. They're huge, maybe as big as this ballpark."

In more than 15 years of integrating birds and baseball, I have never seen a real Blue Jay or oriole at Fenway. But I have seen birds associated with my home in the wilds of Vermont grace the Fenway horizon. Now, as Casey and I share a frank, a Great Blue Heron—long, slender, and graceful, a DiMaggio among local birds—rises off the Charles like a lazy fly ball, passes above Lansdowne Street, over the Citgo sign and Boston Latin School, and then disappears beyond Commonwealth Avenue into the blue haze. Species number two.

Casey shifts his attention to the grounds crew readying the hoses to water down the infield. Seven House Sparrows land on the screen behind home plate. Number three. Rob Deer, the Tigers' well-muscled outfielder, fouls a pitch into the screen; the birds scatter. Mike Pessia, the usher behind home plate, leads me back to row KK, seats 136 and 137, directly below the sparrows' roost. Pessia claims that this is the dirtiest aisle in the park, particularly after a two-week road trip, when 14 days' worth of guano cakes the seats.

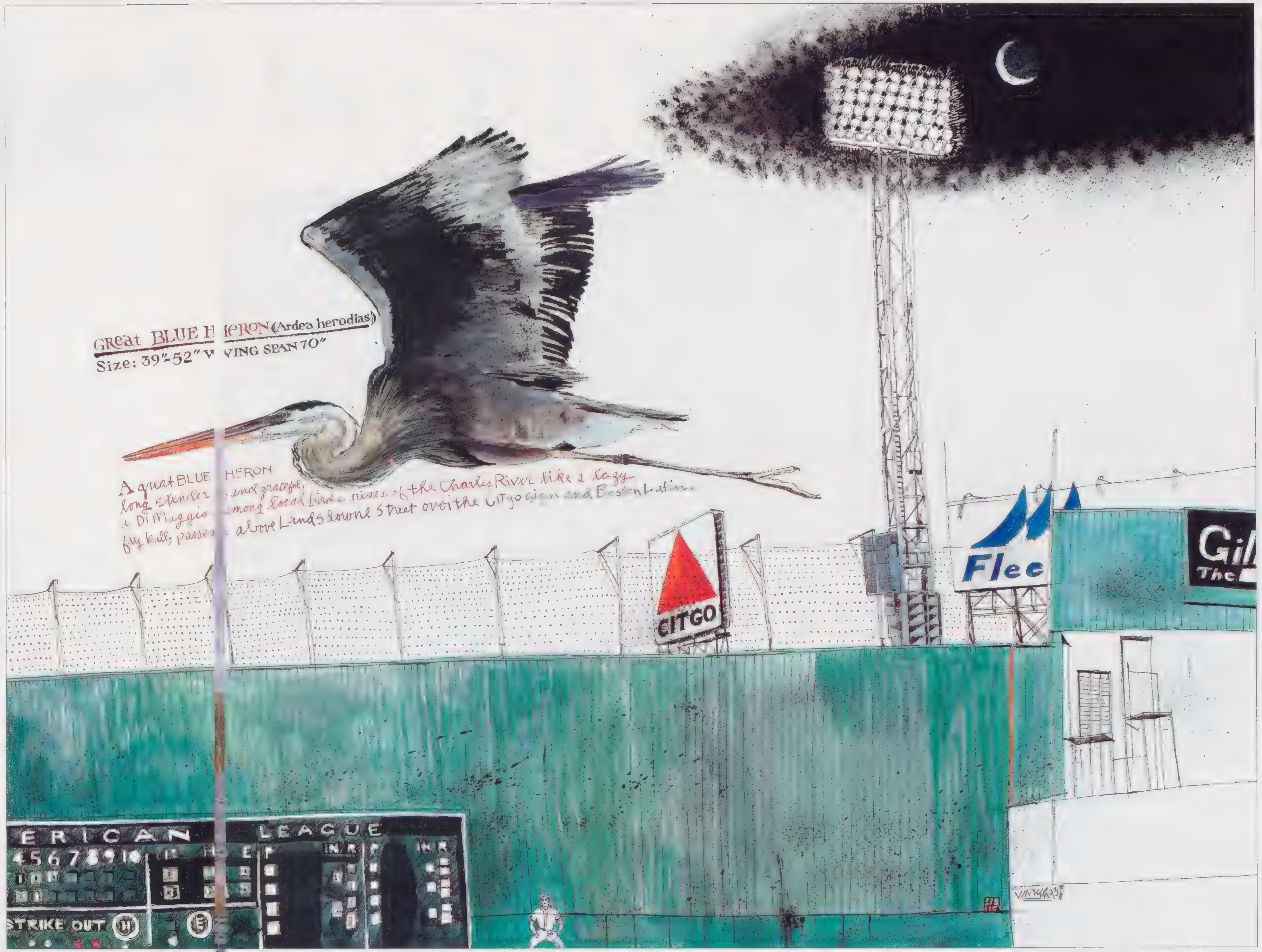
My single-game record for birds at Fenway is 13 species, which is also my American League record. Every visit, I see the Fenway faithful—starlings, pigeons, sparrows—busying themselves on girders and beneath rows of folded seats, feeding, socializing, procreating. Reared in the framework of the stadium, serenaded by the crowd, these feathered miscreants tune to the cycle of home stands like gulls to the tide and are geared for a nine-inning feeding frenzy: a Lucullan feast of hot dogs, peanuts, and melted ice-cream sandwiches. For them, the park is one of Boston's premier bird feeders. When a starling passes me, a wedge of Fenway Frank in its bill, I look for a nest, usually in an open pipe or concrete cavity. In early summer rowdy juveniles assault darker-colored, glossier adults under the mezzanine or above the playing field, begging, begging, begging for food—the same response the vendors provoke in human kids.

After examining the sparrow guano, I am directed by Pessia to one of his colleagues, Ronnie Morrison, Fenway's unofficial pigeon connoisseur, who ushers the right-field boxes. Morrison points out what he calls the "Pigeon Poop Capital" beneath the right-field staging. I look up. Species number four leaves on cue. When the Sox are on the road, he tells me, pigeons lunch in Boston Harbor. I ask about starlings. Morrison says that in 10 Fenway years he has never seen one. A few minutes later, a starling arrows past, stiff-winged and short-tailed, a little, dark crescent. Then another. Species number five. Morrison says, "Oh, *those* are starlings!"

Casey and I return to the third-base side of home plate as a second Great Blue Heron glides over the Jimmy Fund sign in right. A two-heron game, a footnote in my record book. But where are the gulls, Ring-billed or Herring or Black-backed? Joe Mooney, Fenway's buildings and grounds superintendent, once told me he forecasts the weather at the park by the presence or absence of gulls. When a storm passes offshore to the south of Boston, the wind pushes the gulls inland, above the bleachers, where they scavenge chicken bones after the game or settle on the empty field, bunched together facing the tempest like fish in a current, spitting up balls of fractured crab shells on the grass. For the moment, gulls ride the offshore breezes.

A baseball rolls toward the box seats. "Boys" who shave claw each other as they reach for it. Larry Herndon, the Detroit batting coach, picks up the ball and hands it to Casey, who takes his eyes off the grounds crew and, beaming with joy, hugs the ball to his chest like a teddy bear. Minutes later, Cecil Fielder bombs one over the Green Monster, a high arching fly headed toward New Hampshire, and a Merlin—a dark, robin-sized line drive of a falcon—streaks for Boston Harbor. Number six for the day and a baseball first for me. "A falcon, Casey. Look—a *falcon*." He is oblivious to all but his trophy as he fingers the grass stain along the ball's stitching.

Roger Clemens takes the mound; the game begins. In the bottom of the third, the Sox and Tigers are even at one, and I'm stalled at six. Scott Cooper's on third, Wade Boggs on first. One out. An Osprey spirals into the blue beyond the Citgo sign as Tom Brunanasky singles to left. The Osprey tucks its wings, pinches its tail feathers, and slides down an airy chute, fast and with purpose, like Cooper headed home. Number seven, another baseball life bird.


GReat BLUE H ERON (Ardea herodias)
Size: 39"-52" W VING SPAN 70"
A great BLUE HERON
long slender , and graceful,
a DiMaggio among local birds rises of the Charles River like a lazy
fly ball, passes above Landslowne Street over the Citgo sign and Boston Latin
CITGO
Flee
Gil
The
ERICAN LEAGUE
STRIKE OUT

In the top of the fourth, Clemens strikes out the side. Then the wind and the game shift. The Tigers score three runs; Herring Gulls appear, milling above Lansdowne Street, gray-winged, the color of the Yankee's road uniforms. Number eight.

By the top of the seventh inning, the Sox are down 6-2. Clemens is gone; Greg Harris is pitching, two out. Dan Gladden leads off first base, Mickey Tettleton off second, Cecil Fielder off third. Rob Deer works the count full. Two crows, above and beyond the left-center field wall, settle on a chimney to watch Deer single to left. Joe Hesketh comes on to relieve Harris and face Mark Carreon. A Great Black-backed Gull cruises over the Green Monster and flies to center. So does Carreon, to end the inning. Tigers score two runs, and I chalk up species nine and ten.

During a baseball game, species, like runs, come in flurries or trickles or not at all. Several years ago I had 13 species at Fenway in less than an hour, but none after the first inning. Last August, during a well-pitched, 10-inning Frank Viola victory over the Oakland Athletics, I recorded only seven species. Maybe I was too caught up in the action on the field that night. I once missed a ninth-inning, two-out home run that turned a Boston lead into a Yankee victory because migrating nighthawks had ridden into view.

An inning later, the Sox are still down by six when Boggs singles to left. A Black-crowned Night-Heron, squat and lethargic, an avian Don Zimmer, moves above the outfield with measured beats, as though contemplating a pitching change—number 11. Casey is sleeping, lullabied by the crowd. In the bottom of the ninth, the Tigers set down the Sox one, two, three, swiftly, painlessly. A mockingbird, whose fortunes, like mine, do not depend on the outcome of this game, plucks a peanut from an empty box seat behind home plate.

I leave the stadium with two new ball park birds—Merlin and Osprey—and a total of 12 species, one short of my American League single-game record. Casey leaves with a baseball—the most recent of three generations of Levins to come home from a game with an official baseball signed by an American League president—and a fondness for the home team. "Hey, Pop," he says as we leave Fenway. "Know why I like the Red Sox? They have cleaner uniforms." ■

When not at Fenway Park, Ted Levin is home in West Fairlee, Vermont. His most recent book, Blood Brook: A Naturalist's Home Ground, *was published in 1992. He is at work on a personal natural history of subtropical Florida. This article first appeared in the May 1993 issue of* Yankee *magazine.*

CREATURES of HABIT

Can swans relearn their ancient migratory ways?

ART WOLFE

Taking off: Trumpeter Swans that relinquished their wild ways for winter handouts at Montana's Red Rock Lakes refuge are learning to migrate once again, with the help of the U.S. Fish and Wildlife Service.

by Yvonne Baskin

Last spring arrived gray and unusually silent in the high, frozen marshes of Montana's Centennial Valley. As the ice slowly retreated from the shallow waters of Red Rock Lakes National Wildlife Refuge, biologists on snowmobiles anxiously prowled the empty ponds for signs of returning Trumpeter Swans. Their spirits lifted when they caught sight of a pair of swans sporting green collars. The numbers 55AE and 87AE marked them as Red Rock Lakes residents. Or former residents. For the two had been unceremoniously evicted from the refuge five months earlier, along with more than 200 other swans that had grown accustomed to socializing and freeloading on the ponds all winter. From now on, biologists say, the birds will be welcome in summer only.

Pushing the swans out of their secure refuge during the winter of 1992-93 was a bittersweet gamble. Since the refuge was founded in 1935, conservation efforts there have focused on increasing swan numbers, even if it meant luring them into lingering in the valley year-round. But now the goals have shifted. Waterfowl managers in the Rocky Mountains region are pursuing an ambitious strategy of dispersing the swans across a broader swath of their historic range and, in the process, teaching them to be self-sufficient, migratory creatures once again. At Red Rock Lakes that has meant cutting off the winter handouts of grain that once helped to bring the world's largest waterfowl back from the brink of extinction.

"I think the situation with the swans today is comparable in many ways to the Yellowstone grizzly bears that became dependent on the park garbage dumps," says Ruth Shea, a swan expert with the U.S. Fish and Wildlife Service (USFWS). "There was an artificial food source that allowed artificially high numbers of animals to be sustained year-round." At the peak of the feeding, more than 450 swans routinely wintered in the Centennial Valley, both resident birds and winter migrants from Canada who took advantage of a good thing.

JIM YUSKAVITCH (2)

At left and below right, captured swans are released at Summer Lake in south-central Oregon. Biologists hoped to give the birds a "head start" in migration by removing them from Red Rock Lakes. The birds are color marked to make them easy to identify from a distance. The relocation strategy seems to be working: three of the transported swans migrated farther south and spent the winter in California.

Yet the Centennial Valley contains almost no natural winter habitat or food supply. Adult swans weighing 20 to 30 pounds can gobble their own weight in waterweed, water milfoil, pondweed, and duck potato every day. By late October, however, waters in the Centennial Valley begin to ice over, locking the swans' food in an impenetrable deep-freeze.

It was by a fluke of history and not by choice that this inhospitable region on the western edge of Yellowstone National Park became the last stronghold of the Trumpeter Swan outside Alaska. When Europeans first settled North America, trumpeters flourished across most of the continent, winging their way from wintering grounds as far south as northern Florida, Texas, and Southern California up to summer nesting sites that ranged across the Midwest and Canada. But the new Americans developed a taste for roasted swan, swan-skin powder puffs, and swan-quill pens. Commercial hunters slaughtered the birds in vast numbers, an unchallenging task thanks to the swans' habit of circling back low over whatever has flushed them. By the turn of the century fewer than 200 trumpeters were known to have survived, making a stand in this isolated and largely unpopulated high country where the states of Montana, Idaho, and Wyoming meet.

Illegal hunting was still a major problem outside the refuge in the 1930s. So from the beginning, the refuge provided handouts of winter wheat to induce the swans to stay in the safety of the valley year-round.

The gambit worked. In the beginning the refuge had fewer than 70 year-round resident swans. Another 70 nested in Canada but wintered at the refuge. Today, what has come to be known as the Rocky Mountain Trumpeter Swan population has grown to 2,200. (The existence of a second Trumpeter Swan population that summers in Alaska and winters in British Columbia was not discovered until 1954. That flock now numbers about 14,000.)

Those 2,200 swans include about 500 who have renounced their migratory nature and, until recently, spent the entire year in or near the Red Rock Lakes refuge, and another 1,700 Canadian trumpeters that produce 300 to 500 new cygnets a year. Almost all of these Canadian swans make a beeline for the high country around the refuge in late October. Thus 90 percent of the population can be found each winter within 30 miles of Red Rock Lakes. Some spill out of the valley to the east onto the Madison River, Hegben Lake, and Yellowstone Lake. Even more have taken up residence 20 miles south across the Centennials in the waters in and around Idaho's Harriman State Park.

Shea believes the region might have been able to continue subsidizing 400 to 500 swans indefinitely. "The thing that ruined it was when the Canadian flocks discovered it," she notes. "As far as anybody knows, there were only 150 or so birds in Canada in the 1940s. Their populations really took off in the 1970s and 80s."

A decade ago, Shea and others had already begun to warn of the dangers of what she calls the "all-our-eggs-in-one-basket" phenomenon. With nearly all of the trumpeters huddled so close together through the winter, a single disease outbreak or blizzard could set the population back to its 1930s status. But it was hard to reconcile that threat with the popular image of the Red Rock Lakes swans as a conservation success story.

"Few people looked at it critically or closely enough to say 'hey, this is a semi-barnyard situation where we're pumping grain in one end and producing swans out the other.' This has no resemblance to a self-sustaining population," Shea says.

It took a brutal blizzard in February 1989 to bring the urgency of the situation home to waterfowl managers responsible for the Pacific flyway. Icy winds swept across the region, temperatures plummeted to 40 degrees below zero, and the swans' favorite waters in Harriman State Park and eastern Idaho froze solid. Savvy ducks and geese headed south to ice-free waters on the lower Snake River, but 500 swans stayed put, sitting on the ice and growing weaker. News of their plight brought local residents out into the howling storm to toss grain to them. By the time wildlife managers had negotiated with farmers for an emergency release of water from a nearby reservoir—a move that melted the ice from the shallow river—100 trumpeters had died.

After the disaster, the Idaho chapter of the Wildlife Society requested that the USFWS list the Trumpeter Swan as a threatened species. The request was denied, but the threat of listing—and the obvious public support for the stately creatures—was enough to spur the agency to action.

Since 1989 the watchword has been "range expansion," and the goal is to have no more than 10 percent of the Rocky Mountain population wintering at any one spot. The problem is that

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DARRELL GULIN

swans are creatures of habit, not pioneers. The migration pattern cygnets learn from their parents in their first winter usually locks in a tradition they will follow for the 25 to 30 years they may live. To break those traditions, biologists began in the early winter of 1990-91 what has now become an annual ritual: rounding up hundreds of swans and trucking them to suitable habitat in southeastern Idaho, Oregon, Utah, and Wyoming.

“We want to break this bottleneck and get them dispersed to historic haunts again,” says Chuck Peck, Trumpeter Swan coordinator for the USFWS in Pocatello, Idaho. “We also want to restore them to their original condition as a migratory population sustained by natural food sources.”

During the first three winters, biologists from the USFWS and various states succeeded in capturing and relocating 887 swans, a task that gets more difficult each year as the swans grow wiser and warier.

Rounding up swans in winter on shallow, half-frozen lakes and rivers has been a daunting challenge for staff and equipment. In the first winter biologists learned that net guns freeze up and Hovercraft fail quickly in Arctic conditions. The most successful strategy has proven to be chasing down swans in an airboat on dark, snowy nights, blinding them with aircraft landing lights, scooping them up in salmon nets, and swaddling them in onion sacks.

The capture is the whole battle. Once caught, the trumpeters submit to handling with passive dignity. They lie on their backs without a hiss or struggle, neck and wings drooping, black feet flopped back on their bellies as biologists weigh them, draw blood samples, and probe their genitals to determine sex and fertility. Most are crated and trucked to their intended wintering grounds by morning.

The scale of the current relocation program is unprecedented, but the notion of using Red Rock Lakes birds to found new populations is not. The small flock of trumpeters that summers in Minnesota, South Dakota, and Wisconsin and winters nearby in Iowa and Nebraska is descended largely from refuge swans. In the Rocky Mountain region, refuge birds were used to found a flock at the Wyoming National Elk Refuge. But such efforts hardly made a dent in the crowds that winter in or near the refuge.

A crucial step in reducing the winter influx of Canadian birds had to be cutting off the free food at Red Rock Lakes and forcing the long-sedentary resident swans to migrate somewhere else for the winter. But first, the refuge staff decided to give most of the cygnets born that year a head start. That meant capturing and transporting them to suitable wintering grounds rather than leaving them to follow their inexperienced parents into the unknown.

So in September 1992 the deafening whine of an airboat pierced the chill fall air as biologists rounded up 42 of the 70 trumpeter cygnets on the refuge. This was a daylight operation since the youngsters, still sooty gray and flightless, were no match for their captors. The majority were trucked off to Summer Lake in south-central Oregon, others to Wyoming or southern Idaho.

As the refuge waters began to freeze, biologists drained the feeding ponds. When no wheat appeared, most swans got the picture and left voluntarily. The rest were shooed away by arm-waving staffers on snowmobiles. By January, only a few swans were visiting the refuge to check out the ponds, then moving on.

Evicting the swans proved surprisingly easy. The other half of the challenge was up to the swans themselves: finding a place to survive the winter and then returning to Red Rock Lakes the next summer.

Apparently a large number did not survive the challenge. About 60 percent of the resident flock—110 birds, including 55AE and 87AE—had been collared to make it easier to track their progress. After they left the valley, only a third were ever spotted again: 29 of them, including 55AE and 87AE, lingered near Harriman, benefiting from a mild winter; three were seen in Yellowstone; and two cygnets made it to Utah only to be shot by hunters. Shea suspects most of the rest wandered into nearby "nooks and crannies" with good but limited vegetation, then died when the food ran out.

Only 75 to 100 swans returned to Red Rock Lakes last summer, half the usual number. This included two dozen breeding pairs. Those birds successfully fledged only 11 cygnets during "a miserable, wet non-summer," according to refuge biologist Kenneth Niethammer. The female 55AE and her mate 87AE, perhaps still too young to breed, occupied a territory but did not nest.

The refuge plans to build back to a summer breeding population of at least 38 nesting pairs, all of whom migrate out for the winter. If resident birds can't fill the bill, Niethammer and others have come up with a number of proposals for encouraging young Canadian birds to take up summer residence in the Centennial Valley.

"In February or March when the Canadian swans start back north, many of them stop in at the refuge," he notes. "One possibility is to trap some of the young birds and clip their wings so that they're forced to spend the summer with us until they molt in July. Hopefully some of them would then adopt the area as their summer home."

The most urgent priority, however, is continuing efforts to break this region's monopoly on wintering swans. "The number of trumpeters in the high country is actually increasing, despite everything we've done so far," Shea says. "We've got to figure out a way to get this population to continue moving south."

To do that, Shea believes agencies must put more effort in the future into conditions on the "receiving end." That means finding isolated, unpolluted wetlands where the shy swans will not have to compete with human recreation. And that's a tall order. "Slow-moving, ice-free water with good vegetation is in short supply, period, and it attracts lots of other waterfowl, too, so that's where the hunting pressure is going to be," Shea points out.

Moving Trumpeters Swans into Utah, for instance, brings them into conflict with the legal hunting season for Tundra Swans—a fact brought home by the shooting of the two cygnets who ventured there after being evicted from Red Rock Lakes. Hunters find it difficult to distinguish the Trumpeter Swan from its slightly smaller look-alike, the Tundra Swan. The Pacific Flyway Council has favored new regulations to absolve hunters who shoot the wrong swans. Others such as Shea would prefer to curtail the Tundra Swan hunt in areas needed for wintering trumpeters.

There are bright spots, however. One has turned out to be Summer Lake, Oregon, where many adult swans and most of the 1992 Red Rock Lakes cygnets have been released. "Three of those cygnets migrated south on their own after they were released and spent the winter on a wetland northwest of Death Valley, California," Niethammer reports. "They moved back to Oregon for the summer. This is our most promising area and may turn out to be both a nesting and a wintering ground."

If the Trumpeter Swan is to have a secure future in the Northwest, wildlife managers will have to find, or create, more sites like Summer Lake. ■

Yvonne Baskin is a California-based science writer who often winters in Montana. She is a frequent contributor to Discover *and* Science *magazines, among others.*

For more information, write to: The Trumpeter Swan Society, 3800 County Road 24, Maple Plain, Minnesota 55359, or call (612) 476-4663.

Further Reading

Bliven, Naomi. "Aristocrats." *The New Yorker*, December 25, 1989.

Shea, Ruth (ed.). "Management Plan for the Rocky Mountain Trumpeter Swan Population," Pacific Flyway Council, July 1992. U.S. Fish and Wildlife Service/Idaho Department of Fish and Game Southeast Idaho Refuge Complex, 1246 Yellowstone Ave., A-4, Pocatello, Idaho 83201.

At left, a Trumpeter Swan rests at river's edge in Yellowstone National Park. The magnificent birds once flourished across North America, before settlers arrived and—with a taste for roasted swan, swan-skin powder puffs, and swan quill pens—nearly caused their extinction. The Red Rock Lakes refuge allowed populations to rebound; now they must disperse to other habitats.

A Birder's Guide to SPOTTING SCOPES

by Tim Gallagher and Heather Gerhart

Lab reviewers compare the latest scopes for birding

One thing we learned quickly while conducting this scope review is that scopes are a heck of lot harder to compare than binoculars. Think about it: Each binocular has only one pair of built-in eyepieces. To run a comparison test you just get a stack of binoculars and compare them side by side in a variety of situations. What could be simpler? Most scopes, on the other hand, have optional, interchangeable eyepieces. With one scope model, you might have the choice of half a dozen or more different fixed-power eyepieces and a couple of zoom eyepieces. To make matters worse, a scope may excel with one eyepiece while being nearly useless with another.

To simplify matters, we decided to compare each scope using eyepieces of exactly the same power, if available. We chose the 20X-60X zoom eyepiece, which is popular with many birders because of its versatility. Optical purists may cringe to read this. The conventional wisdom has always been that zoom eyepieces are never as sharp and bright as fixed-power eyepieces. This was largely true in the past, but recently several optical companies have developed zoom eyepieces that are excellent for birding. Considering the convenience of zoom eyepieces and the fact that many of them have improved so drastically, we can no longer see any reason to opt for fixed-power eyepieces.

TIM GALLAGHER (2)

We had at first considered comparing all the scopes using 20X wide-angle eyepieces, which are also popular, but decided against it because there's so much less difference between the scopes at this power. Let's give them a real test, we thought. Zoom them from 20X to 60X on a dreary day and see which ones deliver the clearest, most watchable image.

A dreary day is just what we got. Instead of conducting this review during the long, balmy days of summer, as we usually do, we opted for late October. It sounded like a great idea when we thought of it. But later, as we stood shivering under leaden skies with snow threatening, we had our doubts.

Six birders participated in (or, should we say, endured) the review. Four were present or former members of the Sapsuckers—the Lab's resident big day birding team—and have competed at least twice in New Jersey's annual World Series of Birding. The reviewers included Ken Rosenberg, senior scientist of the Lab's Bird Population Studies program, Kevin McGowan, curator of Cornell's Bird Collection, Ned Brinkley, a Cornell grad student, Cynthia Berger, managing editor of *Living Bird,* Heather Gerhart, Crow's Nest Birding Shop manager, and Tim Gallagher, editor-in-chief of *Living Bird* and past captain of the Sapsuckers.

As you might expect in a review of this kind, the top contenders also tended to be the most expensive scopes. In terms of brightness and clarity at high powers, the Questar was unbeatable, which is no doubt the reason that most major bird tour companies carry one along on all their trips. This scope can bring in a recognizable image of a bird at impossibly long distances. The Questar switches easily from low-power to high-power by turning a tiny lever. One thing that might bother some people is that the image is reversed—if you pan the scope to the right, the image in the eyepiece moves to the left—but Questar fans claim that this is easy to get used to. The worst thing we can say about the Questar is that it costs at least twice as much as any of the other top-rated scopes. Ned Brinkley summed up the reviewers' opinions well: "Questars are the toys of the super-rich . . . I want one!"

Moving down into a more affordable price realm, we found four outstanding spotting scopes in the $1,000 to $1,600 range: the Kowa Prominar TSN-4, the Bausch & Lomb Elite 77mm with ED-prime glass, the Optolyth TBG-80 HD, and the Swarovski ST-80. For several years, the Kowa TSN-4 has been the undisputed champ in its class. Its fluorite objective lens and excellent zoom eyepiece provide a bright, clear image, even in poor light. With all these great contenders emerging on the scope market, the venerable TSN-4 wobbled, but did not quite topple from its place at the top of its class. According to Cynthia Berger, the TSN-4 had the most natural-looking color of the scopes we tested. And Ken Rosenberg, who owns a TSN-4, said that after comparing his scope side by side with the other top scopes, "I can see no reason to prefer any of the others over mine."

Before we move on to the next scope model, however, we should offer one word of caution about the Kowa scope line: a number of birders have complained about Kowa's uneven quality control. It appears that not all Kowa scopes are created equal. Some individual scopes of the same model seem superior to others. Ken Rosenberg's battered five-year-old TSN-4, for example, was noticeably sharper than a brand new TSN-4 we set up next to it. This should not necessarily discourage you from purchasing a Kowa scope if you are so inclined, but *do* be sure to buy it from a dealer who will exchange your scope if you're dissatisfied for any reason. Hopefully, the top managers at Kowa will get the message and be discouraged from sitting on their laurels.

The other scopes in the top group are definitely worth looking at. You might find that some of their features make them better than a TSN-4 for your particular needs. The Bausch and Lomb Elite 77mm with ED-prime glass echoes many of the good points of the TSN-4: it has a convenient, easy-to-use focusing knob that allows you to change the focus with one finger, bayonet-mounted eyepieces, a built-in, pull-out lens shade, and it produces an equally bright, sharp image. Most of the reviewers liked the look and feel of the Bausch and Lomb scope more than the Kowa. While looking through this scope, however, we did notice a slight yellowish tint that was not present with the other scopes. The color shift is probably not pronounced enough to cause confusion in bird identifications, and it may be something that is only detectable on a bleak day. The Bausch and Lomb's 20X-60X zoom eyepiece did not perform as well for eyeglass wearers as the Kowa's.

In the Lab's latest scope tests, the Questar, far left, soared high above the competition in terms of brightness, clarity, and overall quality. But the Kowa Prominar TSN-4, above, still clings to the top spot in its price class.

The Optolyth TBG-80 HD is also a very good scope, only marginally less bright and sharp than the two mentioned above, and uses a similar knob mechanism to focus. Some birders may prefer this scope because of its ruggedness and armor coating. We took one with us on the World Series of Birding a couple of years ago, and it definitely proved its worth in the field. On the down side, when the eyepiece is zoomed out, the field of view is very narrow, especially for someone who wears eyeglasses. In addition, the TBG-80 HD uses screw-in eyepieces, which are more trouble to switch quickly in the field than bayonet-mounted eyepieces, and there's also a danger of cross-threading them.

Of the scopes in our top class, the Swarovski ST-80 is the only one that doesn't have either an ED-prime or fluorite objective lens. Both ED (Extra-low Dispersion) glass and fluorite help to bring

Scope description	*Objective lens diameter*	*Eyepiece*	*Case*	*Armor*	*Waterproof*	*Weight (in ounces)*	*Approximate length (in inches)*	*Sharpness*	*Brightness*	*Color*	*Zoom rating*	*Eyeglass rating*	*Focus*	*Suggested retail price*
Group I (over $2,000) *In a class by itself*														
Questar*	89mm	54x, 87x	Yes	No	No	70.9	11.75	1+	1+	1+	NA	1+	1-	$2,985.00
Group II ($1,000-$2,000) *Top of the line models for professionals and serious amateurs*														
Bausch & Lomb Elite with ED Prime Glass	77mm	20x-60x zoom	No	No	No	43.9	13.5	1	1	2	2	2	1	$1,400.00
Kowa Prominar TSN-4	77mm	20x-60x zoom	No	No	No	41.0	14.7	1	1	1	1-	1-	1	$1,500.00
Leupold 12x-40x 60mm variable	60mm	12x-40x zoom	Yes	Yes	Yes	32.0	11.5	3	3	3	3	3	2-	$1,026.00
Nikon Fieldscope II-ED	60mm	15x-45x zoom	Yes	No	Splashproof	39.1	11.4	1	2	1	2	2	2	$1,090.00
Optolyth TBG 80 HDF	80mm	20x-60x zoom	No	Yes	Yes	46.0	15.0	1-	1-	1	2	2	1	$1,600.00
Swarovski ST-80	80mm	20x-60x zoom	No	Yes	Resists	51.9	15.5	2	2+	2-	1-	1	2	$1,340.00
Group III ($500-$999) *Mid-range models for serious birders*														
Bausch & Lomb Elite	77mm	20x-60x zoom	No	No	No	37.9	14.0	2	2	2	2	2	1	$ 640.00
Bausch & Lomb Elite 60mm Zoom*	60mm	15x-45x zoom	Yes	Yes	Yes	26.4	12.25	3	3	2	3	3	2-	$ 589.95
Celestron SS80+*	80mm	18mm (22x)	No	No	No	35.0	13.5	2+	2+	1-	NA	2+	2	$ 798.00
Celestron C90*	90mm	30mm(33x)	Yes	No	No	52.0	7.75	1-	1-	1	NA	1	3	$ 920.00
Kowa TSN-2	77mm	20x-60x zoom	No	No	No	41.0	14.7	2	2	2	2	2	1	$ 795.00
Leupold 20x50*	50mm	20x	No	Yes	Yes	20.5	9.4	3	3	3	NA	2+	2-	$ 646.40
Nikon Fieldscope II with angled body	60mm	15x-45x zoom	Yes	No	Splashproof	38.5	11.4	3+	3+	2	2	2	2	$ 740.00
Group IV (under $500) *For birders on a budget*														
Bushnell Spacemaster with ED Glass	60mm	22x wide angle	No	No	No	38.4	11.6	2-	2-	2-	NA	3	1	$ 479.95
Bushnell Spacemaster	60mm	22x wide angle	No	No	No	38.4	11.6	3+	3	3	NA	3	1	$ 247.95
Celestron S-50*	50mm	25x	No	No	No	21.0	9.0	3	3	3	NA	3	2	$ 218.00
Swift Panther	60mm	22x wide angle	No	No	No	32.0	12.4	3	3	3	NA	3	1	$ 280.00
Swift Searcher	60mm	20x and 40x	No	Yes	No	48.0	12.6	3	3	3	NA	3-	2-	$ 460.00

Each scope comparison category (sharpness, brightness, etc.) is rated on a scale from 1 to 5, 1 being the best. A plus or a minus sign indicates that the scope scored slightly higher or slightly lower, respectively, than the given rating number.

* = Price includes eyepiece

Please note: Suggested retail prices are only provided as a basis for comparison. Actual street prices vary widely and are often considerably lower.

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the principal primary colors into focus together, thereby significantly reducing color fringing and enhancing image clarity and color transmission. As good as the ST-80 is now, we can't help but think how much better it might have been if the manufacturer had used ED glass or fluorite. This scope *did*, however, prove to be one of the most "eyeglass-friendly" of the ones we tested. Though the Swarovski is a little darker and fuzzier than the others at 60X, the field of view is incredible—almost twice the field of view at that power than the others have. "The Swarovski would be excellent for my research," says Kevin McGowan. "I spend long periods trying to read crow wing tags at a distance using 60X. Speaking as an eyeglass wearer, the comfort of viewing is probably worth the slight step down in sharpness from the other scopes in its class."

Unlike the other top-rated scopes, the ST-80 employs a moveable collar around its barrel to adjust its focus. None of the reviewers liked this kind of focusing mechanism as much as a focusing knob. Instead of simply turning a small knob with your fingertip, you have to grasp the focusing collar and turn it with your entire hand, which tends to shake the scope and make viewing more difficult while focusing.

TIM GALLAGHER (2)

Celestron now produces an 80mm ED scope that is less expensive than the other scopes we have so far mentioned. The Celestron SS80+ looks more like something you would use for stargazing than for birding, but it *is* an impressively bright scope. We spent some time watching Mallards and Black Ducks with it next to the pond in Sapsucker Woods, using the 18mm (22X) eyepiece that comes with the scope. The SS80+ captured the feather detail of these waterfowl very well. This scope employs an external, rack-and-pinion style focusing mechanism, which may make it less moisture resistant than the others. It also has a narrow field of view for eyeglass wearers and is not quite as bright and sharp as the scopes in the top group.

A surprising runner-up to the 77mm and 80mm scopes is the Nikon 60mm Fieldscope with ED-prime glass. The numbers 60mm, 77mm, and 80mm refer to the size of the objective lens at the front of a scope—the larger the number, the larger the lens size and the more light-gathering ability a scope has. But with only a 60mm objective lens, this scope delivers brightness and clarity that rival the best of the big scopes. And, for non-eyeglass wearers, the Nikon 20X-45X zoom lens is excellent. The only negative comments we have for this scope are 1) it has the focusing collar on the barrel, 2) it uses screw-in eyepieces, 3) for eyeglass wearers, the zoom lens has a very narrow field of view at mid- to high-power, and 4) in extremely low light, the 60mm objective lens will not deliver as much brightness as a 77mm or an 80mm lens. But if space and weight are concerns for you, this lightweight, compact scope is definitely worth serious consideration.

The Bushnell Spacemaster, the scope everyone used before the Kowa invasion, is still around, and it's now available in a reasonably priced ED model. Although we prefer the general look and feel and especially the focusing mechanism of the Spacemaster to that of the Nikon ED Fieldscope, the image it produces is nowhere near as bright and sharp as the Nikon's. As we mentioned in our last scope review, the Bushnell zoom lens is particularly poor. Equipped with a 22X wide-angle eyepiece the Spacemaster ED is not bad—but for an ED scope, it's disappointing.

At this point in the comparison we brought out some of the non-ED models made by the same manufacturers as the top contenders. We found that the Nikon Fieldscope with ED-prime glass far surpasses its non-ED sister scope, which gives you some idea of what a difference the type of glass can make in the quality of a scope. Comparing the Kowa TSN-4 and TSN-2 scopes side by side under adverse lighting conditions was also very interesting. The two scopes are identical except for the fluorite lens (and whopping price tag) of the TSN-4. The TSN-2 held its own remarkably well with its pricier cousin at the lower powers, but zooming all the way up to 60X in bleak light, the TSN-4 gave a graphic demonstration of its superiority, still providing a sharp, bright image when the TSN-2's image had turned dark and fuzzy. Of course, you can buy two TSN-2s for the price of one TSN-4, which makes the less-expensive scope a pretty good bargain.

The non-ED Bausch and Lomb Elite 77mm scope is inferior to the same scope with ED glass, but it compares favorably with the Kowa TSN-2. Before the new Elite's introduction last year, the TSN-2 had pretty well captured the market in its price range. Now it has a stiff competitor. The two are similar in price, feel and function, and optical quality, but several of the reviewers said they preferred the Elite slightly over the TSN-2.

One decent inexpensive scope we tried out was the Swift Panther 60mm equipped with a 20X eyepiece. Though it doesn't really compare with the high-priced scopes, it's a good buy if you need a little more power than your binoculars will deliver but you don't want to go too far into hock. We also took another look at the Swift Searcher, a scope that received a poor rating in our last review. This scope has been improved, and it performed noticeably better this time. The Searcher is an unusual design. Two eyepieces—a 20X and a 40X—are mounted on a swiveling turret that you can twist around to change the magnification power of the scope. The turret mechanism represents a noble attempt on the part of the manufacturer to provide multiple magnification powers using two fixed-power eyepieces rather than one, possibly inferior, zoom eyepiece. Unfortunately, none of us really cared for the way it works. Swiveling from 20X to 40X, you usually have to refocus the scope, and sometimes you also have to relocate the bird you were looking at. We would prefer it if the Searcher used a good zoom eyepiece or just a single fixed-power eyepiece. Using the 20X eyepiece, the Searcher performed as well as the Panther and the non-ED Bushnell Spacemaster. But eyeglass wearers beware: the eyepieces on the Searcher do not have fold-down rubber cups to protect your glasses.

The Celestron C90 was one of only two catadioptric scopes we tested (the other was the Questar). A catadioptric scope has a large concave mirror at the back that magnifies the image and bounces it back to a smaller mirror up front, which in turn bounces the image back to the eyepiece. This is a popular design in astronomy telescopes. The C90 provides a good, bright view in a relatively small package. It may be less rugged than a conventional spotting scope, and some birders will find it awkward to use. (The large focusing collar is especially cumbersome.) But it's definitely a great scope for the price.

Moving into the more compact scopes, we looked at the Bausch and Lomb Elite 15X-45X 60mm Zoom, the Leupold 12X-40X 60mm Variable, and the Leupold 20X50mm. The Elite has a sleek roof prism design and rubber armoring. At low power, it provides a crisp, clear, bright image, but the view deteriorates quickly as you zoom up in power, particularly if you're wearing eyeglasses. On the plus side, this scope is nitrogen-purged to make it waterproof and fogproof. The Leupold 12X-40X is also waterproof, but it is heavier, bulkier, and not as sharp as the Elite. The other Leupold, the 20X50mm, was the smallest scope we tested. It fits easily in a small backpack. Though the scope has some limitations—the 50mm objective lens is not as bright as a 60mm in dim light—it is water resistant, lightweight, incredibly compact, and produces a decent image. Most of the reviewers said they would like to have one to take along traveling if they didn't have room in their luggage for a large scope. We also looked at a 50mm scope from Celestron, the S-50, but it did not compare to the smaller Leupold in brightness, clarity, or ease of use.

As you may have discovered from reading this review, there are a lot of scopes to choose from, most with their own distinct advantages and disadvantages. How can you hope to choose between them? Ask yourself a few questions about what you require in a scope. Do you need a scope that's great in dim light? Are size and weight factors in your decision? Are ruggedness and moisture resistance important? How much money can you afford to spend? Look at the chart that accompanies this article, and compare the individual scope ratings.

Rather than giving each scope an overall rating, we rated the scopes in several categories—sharpness, brightness, color fidelity, zoom lens rating, eyeglass rating, and ease of focus. We'll leave it up to you to determine which factors are most important to you. For eyeglass wearers, the column called "Eyeglass Rating" should be one of the most important categories. No matter how optically sharp and bright a scope is, it doesn't do you any good if you can't see a big enough image through it. The key is to define your own particular needs. Only then can you be assured of getting the scope that's best for you. ■

Lightest and most compact of the scopes reviewed, the Leupold 20X50mm, far left, provided a good image in a tiny package, but in dim light it wasn't as bright as the larger scopes. Though the Celestron C90, above, is somewhat awkward to focus, this scope is sharp, bright, and reasonably priced.

Tim Gallagher is editor-in-chief of Living Bird. *Heather Gerhart is manager of the Lab's Crow's Nest Birding Shop.*

A DAY FOR THE BIRDS

by Rick Bonney, Jamie Reaser, and Martha Fischer

Celebrate International Migratory Bird Day

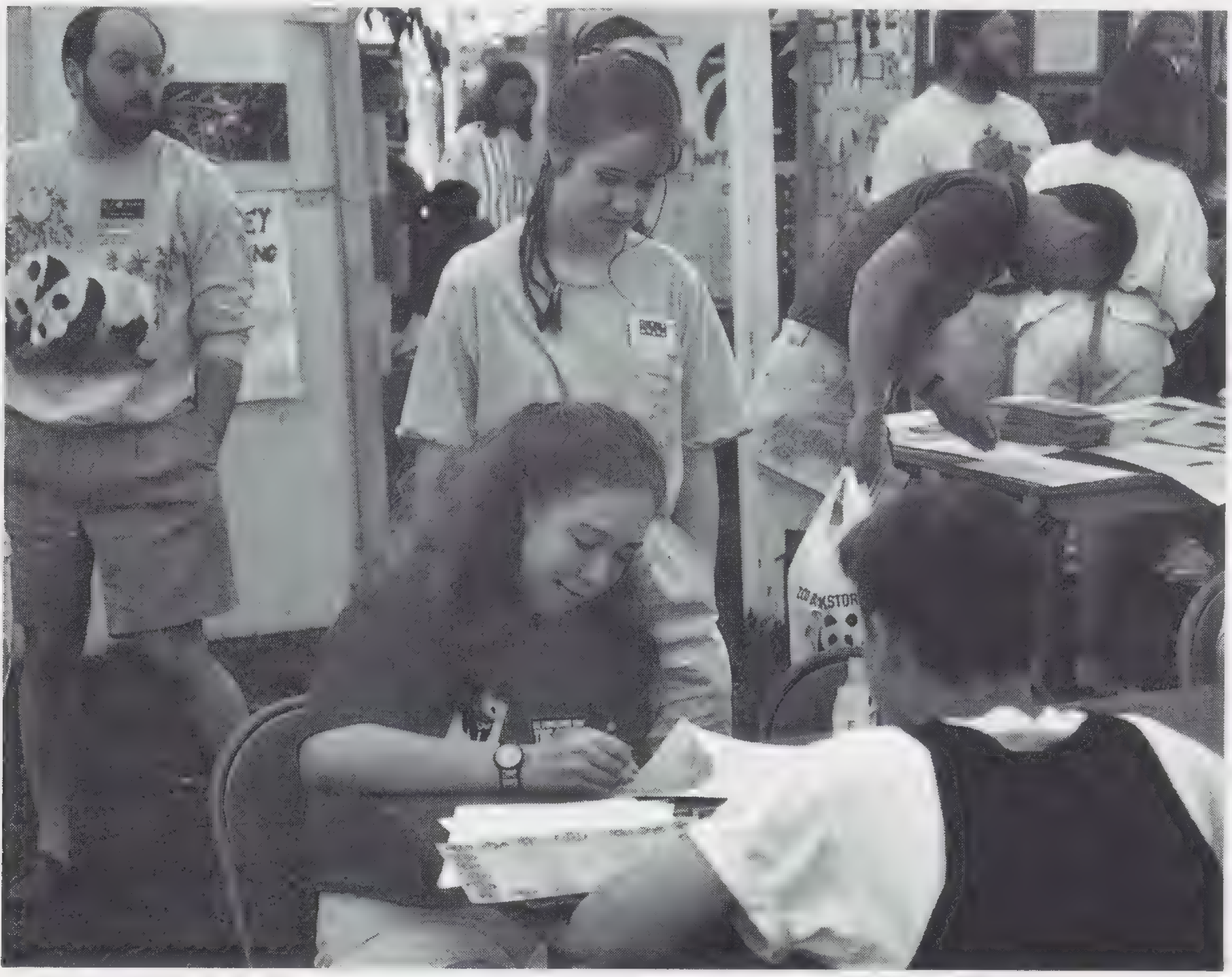
The afternoon we first talked about International Migratory Bird Day (IMBD), we thought it seemed like a good idea. But we wondered whether anyone else would think so. Would birders and conservationists accept our challenge: to go out and educate others about the wonders of migratory birds and to exhort people to help with bird conservation? Or would our proposed IMBD seem like just another Earth Day—or worse yet, like the National Celebration of the Horseradish?

We needn't have worried. A few days after that first IMBD, which took place on May 8, 1993, its success was obvious. Consider:

- In Washington, D.C., 15,000 people, including Chelsea and Hillary Clinton, visited the National Zoological Park where, at the Kid's Tent, Chelsea and her classmates educated the public on the wonders of the rainforest, winter home to many neotropical birds. Ornithologists from the Smithsonian Institution led a birding trip to Roosevelt Island, which was reported on National Public Radio's "Morning Edition."
- More than 5,000 birders participated in the second North American Migration Count, tallying 535 bird species—1.957 million birds—in 44 states and four Canadian provinces. Jim Stasz, a birder from Maryland, initiated the count and has gathered and stored the data collected by conservation clubs across the continent. Jim plans to pass the data on to the National Biological Survey so that more people will have easy access to the numbers. As the count grows and as more data are amassed, a picture will emerge of the flight paths, distributions, and abundances of songbirds during migration.
- Several states—including California, Oregon, Washington, and Idaho—had Migratory Bird Day officially declared by their governors,
- In Alaska, the Tongass National Forest hosted a mist-netting demonstration. Staff from the forest also participated in a radio talk show, wrote an article for the local paper, and presented a slide show to a college biology class.
- The Colorado Bird Observatory organized a native tree and brush planting project, distributed a youth education curriculum, and offered a one-hour program on migratory birds at a local nature center.
- In California, the Golden Gate Audubon Society raised $10,000, which was donated to the East Bay Regional Park District to purchase and restore prime wetland habitat used by thousands of migratory songbirds and waterfowl. That property had been slated for development, but will now be protected as park land.

And these are just a few of the highlights. In all, more than 120 different events took place in 44 states and four Canadian provinces. We are thrilled that this inaugural effort to educate people about the plight of neotropical migratory birds reached such a large audience across North America.

IMBD was coordinated by the Smithsonian Migratory Bird Center (SMBC) as a project of the Information and Education Working Group of Partners in Flight/Aves de las Americas. It was a perfect example of how Partners in Flight, also known as the Neotropical Migratory Bird Conservation Program,



SMITHSONIAN MIGRATORY BIRD CENTER

President Clinton's daughter, Chelsea, center above, and her classmates help with an International Migratory Bird Day event at the National Zoological Park.

can facilitate cooperation among many different agencies and groups. Partners in Flight is a coalition of more than 50 government agencies and more than 20 nongovernmental organizations, all working together to enhance migratory bird populations and the vital habitats that sustain them.

As part of the effort, the SMBC, a research and education program for the international conservation of neotropical migratory birds, produced an IMBD organizer's handbook with materials compiled from diverse conservation groups including the National Audubon Society, the National Wildlife Federation, the Rainforest Action Network, the U.S. Fish and Wildlife Service, and Zero Population Growth. The handbook (which organizers could purchase for a $5.00 photocopying charge) included information on how to run local conservation campaigns, how to improve backyard habitat for birds, children's educational activities, and much more.

CHARLA STERNE/U.S. FOREST SERVICE

Brad Andres of the USFWS shows these youngsters how to identify a songbird during a mist-netting demonstration in Alaska.

Then the folks at SMBC sat back and waited—and as you can see, the results were encouraging.

We want to expand on the successes of 1993 this year. Help us celebrate IMBD on May 14, 1994.

Our goals are simple: to heighten public awareness of neotropical migratory birds and the threats to their populations, to teach people how they can contribute to migratory bird conservation projects, and to make people more aware of the biological and economic links between North America, where neotropical migratory birds breed, and Latin America, where they spend their winters.

Our methods are simple, too. We're creating an International Migratory Bird Day organizer's packet to replace last year's handbook. If funding allows, it will include an updated handbook, a citizen's guide to migratory bird conservation (this item is presently being prepared as a joint project between the Cornell Lab of Ornithology and the National Audubon Society), sample brochures, proclamations, news releases, and more. The packet will include everything a potential organizer would need to put on an event for International Migratory Bird Day, whether it be as simple as a lecture, slide show, or bird walk, or as complex as an organized bird count or development of a conservation plan.

International Migratory Bird Day will be coordinated by the Smithsonian Migratory Bird Center, the Lab, and the National Audubon Society. For more information, write to the Partners in Flight Information and Education Working Group, c/o Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850, or call (607) 254-2440. ■

Rick Bonney is director of the Lab's Education and Information Services and chair of the Partners in Flight Information and Education Working Group.

Jamie Reaser is a graduate student at Stanford University's Center for Conservation Biology. She coordinated the 1993 International Migratory Bird Day as a staff member at the Smithsonian Migratory Bird Center.

Martha Fischer is an education assistant at the Lab and the Lab's Partners in Flight information coordinator.

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IN THE FIELD WITH JACK CONNOR

by Cynthia Berger

Good writing and good birding go together for our contributing editor

Jack Connor teaches writing at Stockton State College in Pomona, New Jersey. Today he's meeting his class at Brigantine National Wildlife Refuge, six miles from campus. The students, sophomores and juniors in sweatshirts and baseball caps, arrive in relays, four or five to a car, at Connor's post on the east dike.

They scan with binoculars and take turns peering through spotting scopes. Connor, who's wearing the owlish glasses of an academic under a funky broad-brimmed hat, radiates enthusiasm as he points out a Boat-tailed Grackle, a wedge of Snow Geese, a Double-crested Cormorant perched on a rotting post, and then, a mystery bird: yellowish, finch-like. The students flip through field guides while Connor urges them on. "Ooo, I'll let *you* figure that one out," he teases.

Wait a minute. This is a writing class?

Yes. "The Biology of Birds" is an interdisciplinary course subtitled "Writing Across the Curriculum." Later that afternoon, back from Brig, Connor flips the switch on his office computer and logs on to the campus network to demonstrate.

"Look at this," he says as he scrolls through pages of text like a grandparent flipping through baby pictures. "I have the students describe their sightings for each other in this electronic conference. It really gets them going."

The art of good writing and the science of bird study converge in Connor's course, just as they do in his *Living Bird* column, "In the Field," and in his recent book, *Season at the Point.* How Connor himself arrived at this confluence is the deliciously ironic tale of a reluctant birder.

Growing up in New Jersey, the eldest of seven children, Connor patiently resisted his mother's efforts to interest him in birds. "She used to take me on these trips," he says. "I'd look through the scope, I'd say, 'Huh,' and then I'd go for a walk or something."

Connor guarded his antipathy to bird watching in the early years of marriage to his college sweetheart, bird watcher Jesse Easton. "We lived about three miles from the Great Swamp [a New Jersey birding hot spot]," he continues. "Jesse would go over there, I'd stay home."

Meanwhile, Connor was teaching ninth-grade English, working on a master's degree in English literature, and struggling to write a novel. "My first job," Connor remembers, "I had three ties. By the end of the year the kids gave me a tie."

Then the two decided to enroll at the University of Florida in Gainesville, he to pursue a Ph.D. in English, she to finish her degree in psychology. "I wanted to teach older people," Connor remembers. "Junior high . . . ." He sighs. "A lot of your time is spent in discipline."

With the move to Gainesville came the epiphany Connor describes in the preface to his first book, *The Complete Birder.* Driving through the countryside to escape their overheated student apartment, Jack and Jesse spotted what looked like Turkey Vultures circling over a lake.

Even to eyes crusted by twenty-plus years of willful blindness, something looked wonderfully wrong . . . . "Jesse!" I shouted. "Eagles! Eagles! Eagles!" . . . .

"And that's the moment I became a birder" I always say when telling this story aloud, but you don't have to be a birder to appreciate an eagle. Walking home the next day, I spotted a woodpecker on a telephone pole, opened Jesse's field guide as soon as I came in the door, and was stunned to discover that . . . [about 10 species] looked like the one I'd just seen. I grabbed the book and the binocs and raced back to the telephone pole. The woodpecker was gone. That was the moment I became a birder.

The years that followed were a whirlwind of field trips. Life lists lengthened. And with a friend's encouragement, Connor started to write a column about birds for the Alachua Audubon Society newsletter. Still, says Connor, "it was two different things, writing for the newsletter, and being a literary person—totally split." His doctoral dissertation examined the narrative shape of the Quixotic novel; his column covered local birding highlights.

"I spent hours on that column," Connor laughs. "I didn't even sign my name. I was embarrassed; I'd only been birding a few years—a lot of people knew more than I did. But I learned a lot, because I was finally forced to put in writing what I knew. It's like what I do now for my students—if you put it in writing, if you have to flip through the book a little bit, you learn more."

Degree in hand, Connor moved back to New Jersey and began teaching at Drexel University in Philadelphia. But he was drifting away from literary criticism. "People in my field were writing things that only about three other people could understand," Connor says. "Meanwhile, I was starting to sell more journalism." He wrote an essay for *Newsweek,* a story for *Alfred Hitchcock Mystery Magazine,* a piece on the world boomerang champion for the *Phildelphia Inquirer.*

And he was birding New Jersey. "I finally realized," says Connor, "this is a pretty good state! My eyes were opened to the birds that I should have been seeing when I was ten."

Birding trips to Brigantine took him past Stockton State College. "It looked neat," Connor remembers thinking. "So close to Brig, I thought, I'd love to teach there." Then a Stockton professor called him up after reading one of his essays in the *Chronicle of Higher Education.* Would he speak at a workshop for Stockton faculty, about how to incorporate writing into other classes?

The workshop went well. About two years later, in 1984, a position opened up. "That was lucky," Connor grins. "I really love it here. They do this great multidisciplinary stuff. And it makes sense for me to be doing the kind of writing that students want to be doing in the real world."

Today Connor, Jesse, and their three children live in Port Republic, a New Jersey hamlet that helps you understand the nickname, "Garden State." Their comfortable home is filled with bird art, bird books, and birds: jays and sparrows at the feeders in the front yard, four pet parakeets and a cockatiel chattering in the back room, chickens scratching in the dust near the kitchen door. Nearby are the mill pond, ball field, and river that Connor describes in his column. Brigantine is just a few minutes' drive away.

CYNTHIA BERGER

Who says writers have to toil in garrets? Professor and author Jack Connor takes his *writing class bird watching.*

A fateful encounter at another legendary New Jersey birding spot led to Connor's first book. "There was this fellow at the Cape May Hawk Watch," says Connor. "Pete Dunne. I'd met him a couple a times, a very funny guy." So Connor queried *New Jersey Monthly* magazine: How about a profile of this fanatical hawk watcher? The magazine bought the story and requested an article about birding in New Jersey to accompany it. After the story ran, a publishing company called Connor. They'd seen his article, and they wanted a how-to-watch-birds book. "It ended up being *The Complete Birder,*" says Connor.

The book was a hit with the birding community. It also brought Connor to *Living Bird* as a contributing editor—before it even went to press. *Country Journal* magazine had excerpted the chapter on identifying warblers. A *Living Bird* editor read *Country Journal,* liked the article, and called Connor. An excerpt of his chapter on bird sounds ran in our Spring 1987 issue, under the title, "Quick, Three Beers!" Then *Living Bird* signed Connor up for a regular column, "In the Field."

It began as a continuation of *The Complete Birder*: tips for identifying birds, advice on taking field notes. But Connor says his priorities have changed; he's more interested in understanding behavior. "The column that marked the change for me was the one about Hooded Mergansers on Mill Pond being chased by a gull," says Connor. "I used to bird for the thrill of the chase; now, I can stand at the local pond and say, O.K., there are no new birds out there, I'm not looking for a rarity, but this is still a neat thing to do. There *are* things to think about when you go birding other than 'what is it?'"

Connor played off the tension between birding for sport and birding for understanding in his second book, *Season at the Point,* which covers one autumn in the life of the birds and birders at the Cape May Hawk Watch. John Barstow, who edited the book for Atlantic Monthly Press (he's now editor of *Harrowsmith Country Life*), thinks Connor is headed in the right direction. "Jack's very good at explaining habitat and behavior," he says. "He helps you to understand what you're looking at, not just from the point of view of identifying a bird, but understanding how it behaves.

"Jack also does a good job with dialogue," Barstow adds. "The way he weaves it into the story—it doesn't feel forced or self-conscious. That can be very difficult to do. And his writing is very solid and careful, in the John McPhee school: full of detail and carefully rendered. I think one of the really wonderful things he's written [for *Harrowsmith Country Life*] was an article on vanishing neotropical migrants. I'd like to see him do more writing of that sort, on issues."

For Connor, the details are ever expanding. Right now, he's learning the Latin names of the marsh plants at Brigantine, and he's also studying butterflies.

And the issues? He's pursuing them on his own terms. "If I have a political purpose in writing," he says, "it's getting people interested in the out-of-doors. Most people are interested, but they don't necessarily know what to look for, or how to look at it.

"That's what I try to do, in this course and in my writing. I try to get people over to Brigantine, so they know it's there. Then when they get to vote, when they make choices, hopefully they'll choose wilderness." ■

Spotlight

LOST AND FOUND

by David Wilcove

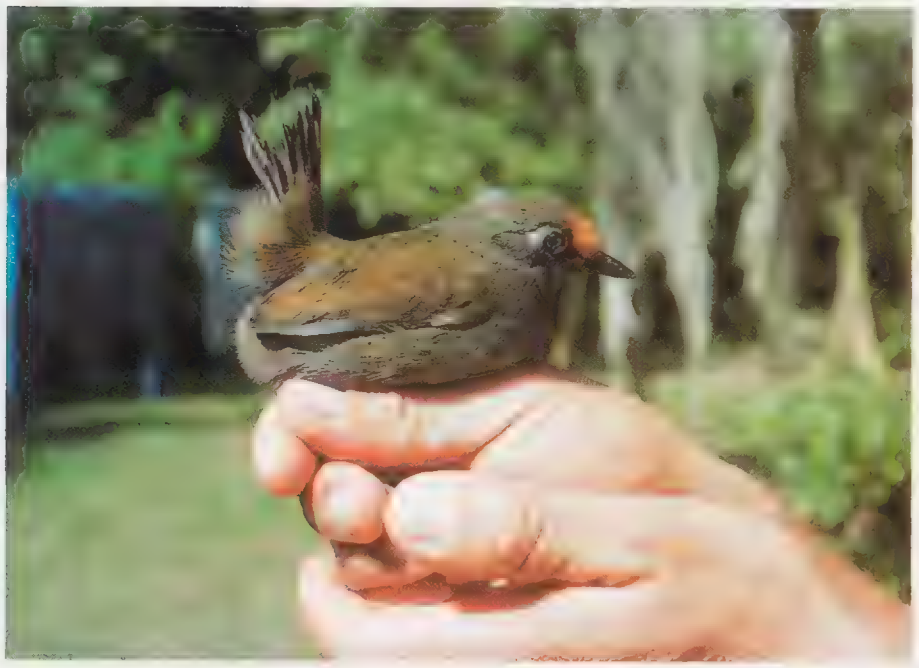
Some tropical birds are much more common than we thought. Or are they?

Any bird watcher who has reported an unusual sighting to the local experts, only to be met with raised eyebrows and other thinly veiled signs of skepticism, can identify with Jan P. Smith. Not content merely to report the unexpected, Smith had the audacity (or courage) to claim the unbelievable: a White-winged Potoo sitting atop a dead tree near Manaus, Brazil, in October of 1985.

No one had seen this bird in over a century and a half—it was known from only two 19th-century specimens collected in coastal Brazil, hundreds of miles from Manaus. Smith's sighting, I am told, was greeted with less than unconditional acceptance. But he would have the last laugh.

A few years later Mario Cohn-Haft, now a graduate student at Louisiana State University (LSU), decided to pin down once and for all a familiar but mysterious whistle that emanated from the Manaus forest at night. Many people had heard the sound, but no one knew the singer. Cohn-Haft managed to lure the mysterious singer into view and discovered it was a White-winged Potoo.

Determined to obtain a specimen, Cohn-Haft used alpine climbing gear to hitch his way up a big tree to a platform where he spent the night whistling at potoos. Around five o'clock the next morning, a potoo swooped directly at Cohn-Haft's head and perched in the very tree where he stood. He collected it, only the third specimen known to science. Subsequent surveys revealed the White-winged Potoo to be a relatively common bird throughout that region of the Amazon.



The rufous-fronted antthrush, a near-mythical bird, was rediscovered by Ted Parker in Peru.

ANDREW KRATTER

The saga of the White-winged Potoo is only one example of the extraordinary discoveries that have revolutionized neotropical ornithology over the past 20 years. Armed with better information, especially with respect to vocalizations, ornithologists have discovered that many little-known birds of the Amazon basin are far more numerous than anyone previously believed. For example, the International Council for Bird Preservation's authoritative new book, *Threatened Birds of the Americas*, lists 320 New World birds that may be at risk of extinction, yet only about a dozen are from the Amazon basin, even though it is the site of the world's richest avifauna.

This sea-change in our understanding of tropical birds became apparent to me last summer when I returned to Ecuador for the first time in 15 years, on a bird watching tour. Our leader carried a tape recorder and a bag of cassettes filled with bird songs. Hiking through the forest, he would suddenly stop, inform the group that he had previously found a particular bird at the place where we were standing, pop the correct cassette into the machine, play the song, and more often than not—presto!—out popped a Pavonine Quetzal or a Rusty-breasted Nunlet.

At times it felt more like ordering dinner from a menu than bird watching, but what a wonderful assortment of birds we saw. From Dugand's Antwrens to Zigzag Herons, our leader had tapes of birds that only a decade or two ago were virtually mythical.

Despite the dizzying pace at which scientists armed with tape recorders are gaining new insights into Amazonian birds, many old mysteries remain unsolved, and new ones pop up all the time. In 1963, for example, LSU ornithologist John O'Neill came upon a flock of six blackbirds bathing in a stream in southeastern Peru. He collected one, and it proved to be an undescribed species, now called the Selva Cacique. It has never been seen again. Other caciques are not particularly shy or rare, making the Selva Cacique's disappearing act all the more puzzling. Another example is the recently described Rondônia Bushbird, known from a single individual captured in a mist net in 1986 and two subsequent sightings. It appears to be very rare and localized, again for no apparent reason.

Then there was the time when the legendary Ted Parker, hiking along a trail in Peru's Manu National Park, heard an unfamiliar song emanating from a floodplain thicket.

When Parker recorded the unseen singer and played back the song, a small brown bird with a bright rufous forehead walked out of the undergrowth and into fame. It was a Rufous-fronted Antthrush, previously known to science from only four specimens collected by Peruvian Indians in the 1950s.

Why is this species restricted to only a tiny area in Peru, and why is it apparently not very common even there? Ornithologists John Terborgh of Duke University and Scott Robinson of the Illinois Natural History Survey have discovered that two closely related birds, the Black-faced and Rufous-crowned Antthrushes, respond aggressively to playbacks of the song of the Rufous-fronted Antthrush. Are they competitively excluding the Rufous-fronted Antthrush from most habitats, forcing it to eke out a fugitive's existence amidst its domineering relatives?

Discovering what makes rare birds rare may seem like an esoteric issue, but it is one of the biggest challenges in conservation biology. Knowing more about patterns of rarity may enable scientists to better determine which species are truly at risk, and how best to protect them.

And the White-winged Potoo? Based on the new information gathered by Cohn-Haft and others, it appears to be in little danger. Or is it? When Cohn-Haft compared the White-winged Potoo he collected in Manaus with the original specimens from coastal Brazil, he discovered that his bird was significantly smaller—so much smaller, in fact, that he believes the Manaus potoo could be an undescribed species.

That leaves us with a new mystery: What has happened to the potoos from the coastal Atlantic forests? They have not been seen for well over a century and a half. Meanwhile, most of these forests have been destroyed, raising the disturbing possibility that the "original" White-winged Potoo is now extinct.

Gain a potoo, lose a potoo. Unfortunately, the "gain" is an abstract result of better knowledge, whereas the loss could be all too real. ■

Further reading

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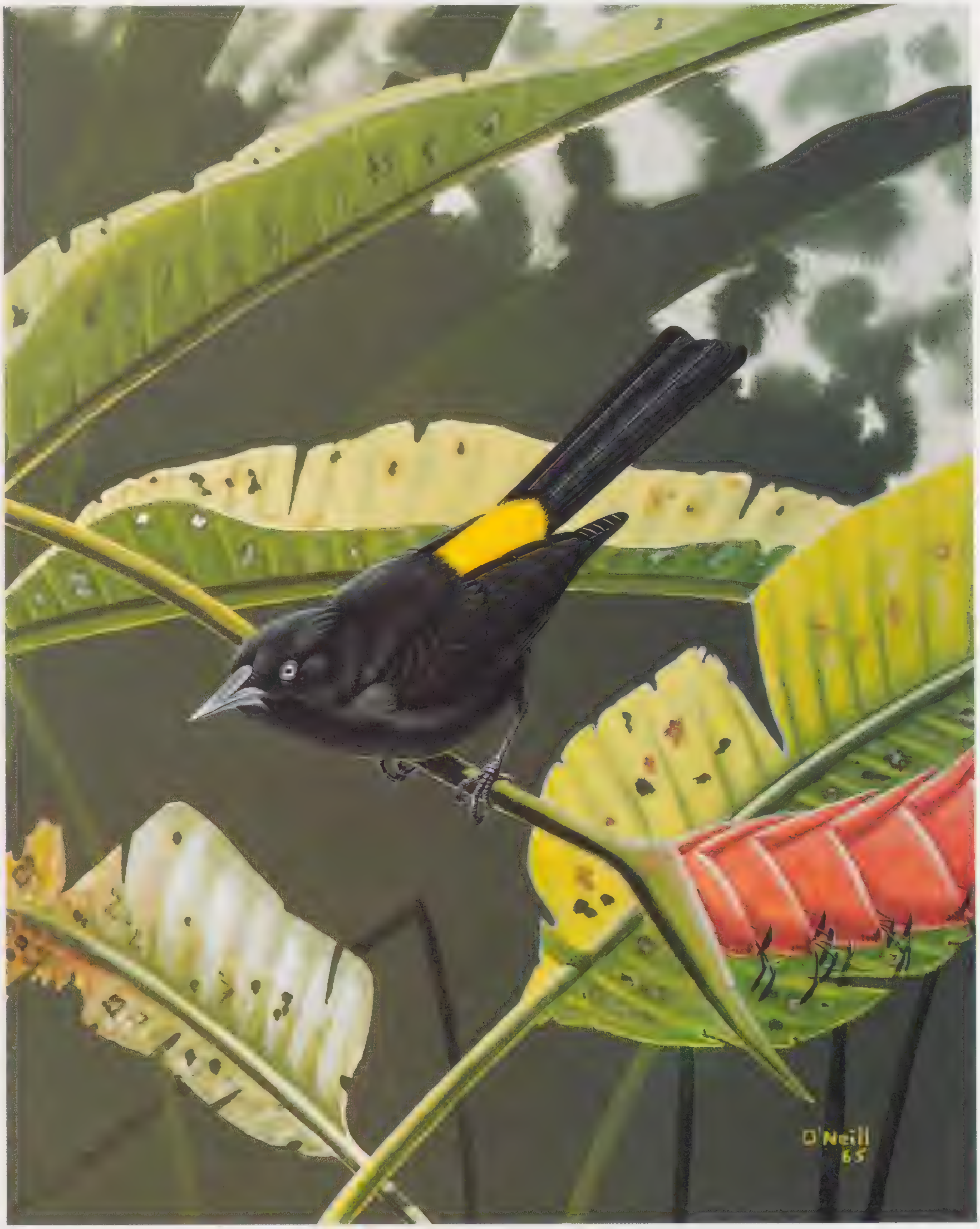


The Selva Cacique, depicted here by ornithologist and artist John O'Neill, was discovered in 1963 and has never been seen since. Other caciques are not particularly rare—so why is this one?

THE OLD MAN AND THE PLOVER

by Pete Dunne

He was an old man, who birded alone, and he had gone 84 days now without finding a good bird.

"Cheer up," the boy had said. Before the fall term, the boy had been his companion. Now, they spoke only by phone. "Remember, we are in September."

"The month the good birds come," the old man said. "Anyone can be a birder in May—even you."

"Go suck an egg," the boy replied, but with humor. The old man had taught the boy to bird and he loved him (even if the old man *did* still call Northern Harriers "marsh hawks").

"Tomorrow I will be at the dikes at dawn," the old man said. "To be there when the tide is full."

"Bitchin," the boy replied. "Find something to make the members of the records committee commit suttee, old man."

"With luck," the old man replied.

He was there before the security gate opened. But he knew the trick of short-circuiting the electronic timer by placing a metal tool box beside it so that it would open.

"I am an old man," he said. "But I know many tricks."

He was well out on the dikes by the time the sun came up, scanning the pools.

"Just the usual stuff," he assessed. "Peeps, yellowlegs, dows, stilts, and the odd pec." Then a falcon put the flocks up and the old man saw the large, dark-rumped plover for the first time.

"Yes," he said. "Yes." And he trained his scope on the place where the bird landed.

At first he saw nothing but the head—which was strangely shaped for a Golden Plover. Then he saw the back, which was brightly spangled, and the underparts, black only to the legs and bordered by white.

"No," he said. "He can't be *that* good."

But he was that good and the old man found a checklist, which was his only paper, and began sketching.

I wish I had the boy, the old man thought. The boy was an ornithology student who knew tertial talk and even the names of birds in scientific Latin.

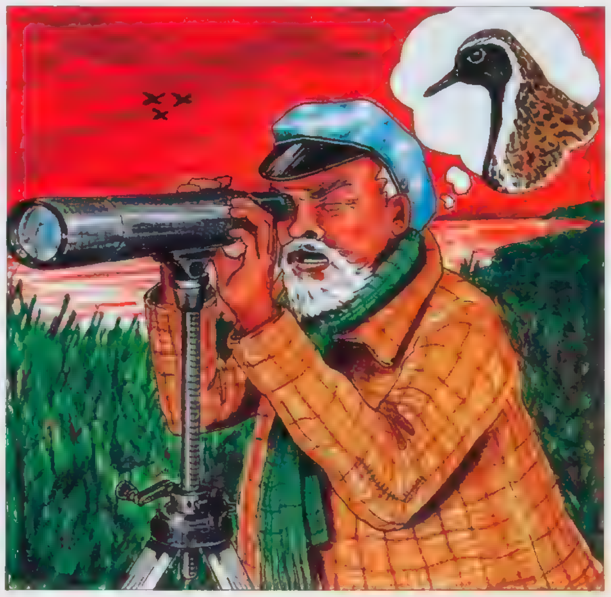
Then he said aloud, "I wish I had the boy. To help me and to see this."

The old man had never seen a Greater Golden Plover and could not recall all the field marks. But he illustrated what he saw, his hand cramping with the effort and his excitement, and was nearly finished, when the falcon routed the bird for good.

"Have something?" a voice asked.

The old man turned to see a stranger approaching. Everything about him was friendly, except for the eyes which were aloof.

"A Greater Golden Plover in breeding plumage!" the old man exclaimed. "You just missed it."



The stranger was silent and his face now matched the eyes. "Unlikely," he said. "There's one record for the lower 48."

"Here," the old man offered, "my notes."

The stranger studied the sketch and handed it back.

"Looks like a *fulva.*"

"What?"

"A *fulva.* Pacific Golden Plover. Don't you know that Lesser Golden Plover was split?"

The old man shook his head.

"Well it was. You need to do some homework."

The old man was humiliated, but not defeated, and he remembered the boy, and how proud he would be, and so he resumed work on the sketch. It was then that he saw two men approaching, members of the state records committee.

"*Ay,*" he said aloud. There is no translation for this word, and perhaps it is just a noise such as a man might make, involuntarily, as his spotting scope goes over a jetty in a wind.

"Who else saw the bird?" the first one asked.

"Did you get photos?" the second one wanted to know.

"Well, write it up anyway," they said before leaving.

I should have brought a camera, he thought, sadly. And I should have had the boy.

His hope was gone, but not his pride. It wasn't until he returned to the refuge headquarters, to log his sighting, and was confronted by the assemblage of birders that this, and all that was left of his happiness, was taken, too.

"Did you notice the length of the legs?"

"Did you check the primary extension?"

"Did you note any signs of molt?"

"Did you see the color of the underwing lining?"

"Have you seen the species before?"

"Are you sure it wasn't just a black-bellied?"

In the end he did not log the sighting, and when the checklist fell to the tarmac as he got in his car he did not care.

Later, a tourist couple visiting Atlantic City took a wrong turn and wandered onto the refuge. The woman, seeing the paper, picked it up.

"What's that?" the man, who was her companion, asked.

"A list of birds found on the refuge," the woman replied. "Someone's scribbled on it."

"I didn't know there were so many birds here."

"I didn't either," the woman replied.

"Maybe we should take up bird watching. I'll bet it's fun."

"Maybe we should. It's got to be more fun than losing money."

At his home, the old man lay face down on the couch. He was sleeping without dreams, and waiting for the boy to return his call. He wanted to say hello and to hear a friend's voice. ■

ILLUSTRATION BY JEFF SIPPLE

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For the Study and Conservation of Birds

SUMMER 1994

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LIVING BIRD

SUMMER 1994 VOLUME 13 NUMBER 3

Greetings from Sapsucker Woods

Taking pictures and finding illustrations for *Living Bird* is always an interesting and varied (and sometimes bizarre) experience. This was particularly true for this issue, which took me from the squalid to the sublime in search of the right images to accompany articles.

My quest for photographs to illustrate Alexander Skutch's article on feral Rock Doves, "The Unappreciated Pigeon," led me to the inner depths of a crumbling Northeastern metropolis, where I loitered near bus terminals and city parks—sometimes lying down amid cigarette butts and grime—trying to snap pigeon-eye-level pictures of the courting birds. In one park I visited, a lone statue of Christopher Columbus stood high above the square, his head and shoulders adorned with cooing pigeons. This seemed appropriate, considering that the root of his name is the ancient Latin word for pigeon—*columba.*

Moving on to the sublime, I visited Cornell University's Hill Ornithology Collection with *Living Bird* designer Kat Dalton to find illustrations and take pictures for Jane Hardy's article, "Birding by the Book." The collection—consisting of rare books, some dating back to the 17th century—is housed on the main campus, five miles from Lab headquarters in Sapsucker Woods Sanctuary.

The books are wonderful—exquisite volumes, bound in leather with gold-leaf lettering and trim, many of them containing vivid, hand-colored illustrations. With white cotton gloves in place, we carefully perused volume after volume, fascinated by the writing and illustrations of some of America's pioneer ornithologists.

I hope you enjoy the issue.

Tim Gallagher
Editor-in-Chief

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Cover: A juvenile Semipalmated Sandpiper takes time to rest and replenish its strength while en route south on its first migration. Photographer John Heidecker took this attractive portrait during late summer at New York's Jamaica Bay.

Right: A feathered pariah to some, the common Rock Dove can be fascinating to observe, if you take time to learn more about the bird. Trace the history of this misunderstood species beginning on page 25. Photograph by Tim Gallagher.

Back cover: A young Laysan Albatross tests its wings on Midway Island. Photograph by Milo Burcham.

LIVING BIRD

SUMMER 1994 VOLUME 13 NUMBER 3

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts. © 1994 Cornell Laboratory of Ornithology.

Printing by Cayuga Press, Ithaca, New York.

Color separations by Brodock Press, Utica, New York.

Printed on recycled paper.

Letters

No More Missing Magazines

I just received in the mail a plastic bag containing the paper wrapper from the Summer 1993 issue of *Living Bird* [but no magazine]. This must be the third or fourth time this has happened in as many years. I don't have this problem with other publications—but they don't use paper wrappers.

Although your covers are beautiful, I don't think protecting them with a wrapper is worth it for me, compared with the frustration of not receiving issues of the magazine. Who knows how many I've missed altogether.

Anyway, if you have a spare issue, please send it: I'd still enjoy it, I'm sure.

Tom Strikwerda
Kensington, Maryland

Since we started using a wrapper to protect Living Bird *covers, we've received about 20 letters like yours every quarter. We promptly sent each person a new magazine, but we worried: How many more people failed to receive the magazine, but never wrote to tell us?*

We tried switching to a heavier paper wrapper; we tried using an extra staple to attach the wrapper to the magazine; and we checked with the U.S. Postal Service to see what else we could do to solve the problem. Their reply? Because the magazines are handled by machinery, a certain amount of tearing is expected—and acceptable.

It wasn't acceptable to us. With the Winter 1994 issue, we started mailing Living Bird *in an envelope. This protects the cover and allows us to send you* Birdscope *in the same mailing. Let us know if this change solves the problem of the missing magazines.*

Why Study Corridors?

Re "Corridors for Conservation" in the Winter 1994 issue: The authors say no studies have shown that species use corridors to travel between habitats, or that species diversity increases when two habitats are connected by a corridor.

Providing a corridor where there might otherwise be roads, grazing cows, or houses will certainly benefit birds and wildlife. We don't need umpteen scientific studies to prove this.

The authors also say "Every dollar spent on a corridor is a dollar not spent on some other conservation measure." However, every dollar spent on another scientific study to prove a common-sense thing is a dollar *not* spent on acquiring and protecting habitat for our birds and wildlife.

Mary C. Dreiling
Syracuse, New York

Logged Land is Protected Land

In the Autumn 1993 issue of *Living Bird* you advised readers to question logging because it destroys habitat

I am a farmer, forester, and logger. Having managed the same properties for more than 20 years, I don't think I have destroyed much habitat. If anything, sound economic management has protected these properties from development.

David C. Sears
Shelburne, Massachusetts

No Neck Bands, Please

Re "Creatures of Habit" in the Spring 1994 issue, permit me to say that I find the practice of neck banding wildfowl to be absolutely appalling. It often inflicts stress and usually results in death when, in winter conditions, ice and snow build up on the collar; the birds are unable to fly or feed and freeze or drown with the weight of the collar. I have seen this with my own eyes.

No matter how much the statistics may be required, there is no excuse for this cruel and archaic practice.

Olive M. Root
Belleville, Ontario

We welcome letters from readers.
Address letters to: The Editors,
Living Bird, 159 Sapsucker Woods
Road, Ithaca, New York 14850.

BirdNews

STEPHEN KIRKPATRICK

Fresh off the farm: a singing Bobolink

CROPLAND GROWS BIRDS

A government program that pays farmers to leave their fields fallow is growing grassland birds instead—on land that's part of the U.S. Department of Agriculture's Conservation Reserve Program (*Conservation Biology,* vol. 7: 934-937; 1993).

A census of breeding birds in four northern states (Montana, North Dakota, South Dakota, and Minnesota) showed 16 species nested in greater densities on reserve lands than in cultivated fields. Only one species, the Horned Lark, was more abundant on cropland.

Of the 16 species that seemed to be flourishing on reserve lands, several—including the Clay-colored Sparrow, Bobolink, Dickcissel, and Baird's Sparrow—have experienced major declines over the past 25 years. Populations of two species—Lark Bunting and Grasshopper Sparrow—have been cut in half. The Conservation Reserve Program may be helping to reverse these downward trends.

THE REAL MACAW

Parrot expert Charles Munn has rediscovered the Blue-throated Macaw in Amazonian Bolivia. Conservationists long assumed the colorful parrot was all but extinct in the wild—it was known only from a handful of museum skins and about 200 captive birds held by Bolivian bird dealers.

A local guide who had formerly trapped and traded the species guided Munn to a palm grove where a pair of the birds nested. About 28 other Blue-throated Macaws have since been located nearby. The exact location is being kept secret, to protect the birds from poachers while Munn studies the birds and develops recommendations for protecting them.

GOLF COURSE BIRDIES

A surge in tourism and development on the Pacific island of Gaum destroyed most wetland habitat for the endangered Marianas Common Moorhen. Recently, however, developers and biologists banded together to make moorhens as welcome as tourists at Manengon Hills, the largest resort on the island.

The developers built about 50 wetlands on the property, to replace habitat removed during the resort's construction. Moorhens began nesting in one wetland soon after it was completed, even though it was located near several golf tees, a golf-cart path, and a two-lane road.

Although artificial wetlands can never achieve the complexity of natural habitat, biologists hope they can still help this endangered subspecies.

ALBATROSS ATTRACTION

It's usually good news when a bird population grows—but not when Laysan Albatrosses, recolonizing the Hawaiian Islands, began nesting on Oahu airport runways. Dogs, cats, mongooses, and gun-slinging humans are attacking the turkey-sized birds, which themselves create hazards for airplanes.

How to resolve this real estate conflict? Last December, Lab associate Stephen Kress and his colleague Richard Podolsky began enticing albatrosses to Kaohikaipu (Black Rock) Island, a wildlife refuge off the Oahu coast. The project is funded through the U.S. Fish and Wildlife Service's Biodiversity Joint Venture Program.

Kress, a National Audubon Society researcher based at the Cornell Lab of Ornithology, specializes in seabird restoration: he has brought Atlantic Puffins back to two Maine islands from which they'd been extirpated, and attracted Dark-rumped Petrels, an endangered species, to safe nesting grounds on the Galapágos Islands.

To convince albatrosses that the island would make a great home, the researchers planted a fake colony there: 50 life-sized albatross models in courtship poses, fuzzy chicks fashioned from sheepskin and wood, and ceramic eggs hand-made by schoolchildren in Ithaca, New York. Kress and Podolsky also installed a solar-powered compact disc player that broadcasts the sounds of mating albatrosses. The Lab's Library of Natural Sounds provided the sexy CD.

STEPHEN W. KRESS

Real researcher Kress with imitation albatrosses (note sheepskin chick).

The ruse seems to be working. Volunteers from the Hawaii Audubon Society and Sea Life Park are monitoring the island; Kress reports that live albatrosses are courting among the decoys.

COMPILED BY CYNTHIA BERGER

Flying Field

IF I WERE A BIRD

by Mel White

On the wings of a dream bird

If the birds were watching me, back when I started watching them, I'm sure they learned my habitat quickly: my family's yard, and the neighbors'; my school, a half-block away; and the alley that ran from our house to the little storefront grocery where I was sent to fetch bread and milk. I was pretty much a permanent resident within this limited range. It was a time in my life when a "Baltimore Oriole" whistling in the backyard ash tree or a "Yellow-shafted Flicker" drumming on the metal roof of our garage was a discovery worth running to tell Mom about. Most of the pages in the field guide were as foreign to me as Zanzibar.

Naturally enough, when birds became part of my life I tried to make them part of my play. The most immediate way to do this was to pretend to be a bird. As it turned out, this was much less satisfying than pretending to be, say, Mickey Mantle or a saber-toothed tiger. It doesn't take many times running down a grassy hill with your arms outstretched to realize that the wonderful thing about birds is that they can fly, and the awful truth about people is that we can't. Pretending isn't a satisfactory substitute; every swoop reaffirms the huge gap between up there and down here. Not even a child's tensile imagination can span the distance.

So I switched from the indicative to the subjunctive: If I were a bird, what would I want to be? Sometimes friends shared this game, but they, not having quite my enthusiasm—not having spent hours tracing and coloring Roger Tory Peterson's paintings, for instance—were at a disadvantage. Their repertoire was limited. How dull and obvious, it seemed to me, to immediately call out "Eagle!" as if that assured unsurpassed glory—as if that cornered the market on bravery. How pretentious. I always enjoyed telling people the truth about eagles—their secret character flaws and their dining habits. Looking back, it seems to me that the children who choose eagles in this game are the very ones who later will run for political office, self-confidently sure that they know what's best for the rest of us. Let them be eagles, I thought, or owls, or, for the vain ones, cardinals or hummingbirds. I wanted to be a "Duck Hawk."

All right—this was pretentious, too, but at least it wasn't obvious. Duck Hawks weren't feathered metaphors, icons on money and flagpoles. Duck Hawks were unknown to most people; they lived in wild places I'd barely heard of, and they didn't give away anything in bravery and fierceness. Best of all, they were the fastest birds in the world. In their deadly stoop from some unimaginable height to knock a doomed victim out of the sky they had been timed at 170 miles per hour: the invincible jet fighters of the bird world.

And then there was Audubon's painting of the bird. He shows a pair of Duck Hawks (he called them "great-footed hawks") tearing into two freshly caught ducks, the female's bill literally dripping blood as she enjoys the reward for her speed and skill. It was a picture to make little old ladies (i.e., the teachers who forced me to spend so many boring hours in school) and prissy girls turn their heads in horror. Ha! No dead fish for the mighty Duck Hawk.

It was an age—and I was of an age—when blood didn't have quite the connotations it has today. Later, scientists (who can be counted on to spoil many things for us) changed the name Duck Hawk to Peregrine Falcon and reported that the bird was perfectly willing to forsake the wilderness for city skyscrapers and live on a steady diet of pigeons. Worse, ornithologists crowned a new world speed champion: the White-throated Needletail, a swift that tears past Asian precipices at more than 200 miles per hour . . . catching bugs.

What bird would I be? I'm not ashamed to say that I still occasionally consider this. From what I've read, I don't believe I'm alone. Dr. Peterson himself is sometimes called King Penguin. My perspective today is different, though: no longer that of a small boy dreaming of adventure, but more like a tired workingman considering a retirement community. Majesty takes a back seat to practicality. Sometimes when I'm on the beach in south Texas, I think that I wouldn't mind being a Laughing Gull. They seem to have a pretty good time. The weather's nice practically year-round, and they always have lots of company. But I'm really not very comfortable in crowds, and there's the matter of food: cast-off french fries in parking lots, stale bread thrown off the back of boats, stuff washed up on the beach. . . . I guess I'll pass.

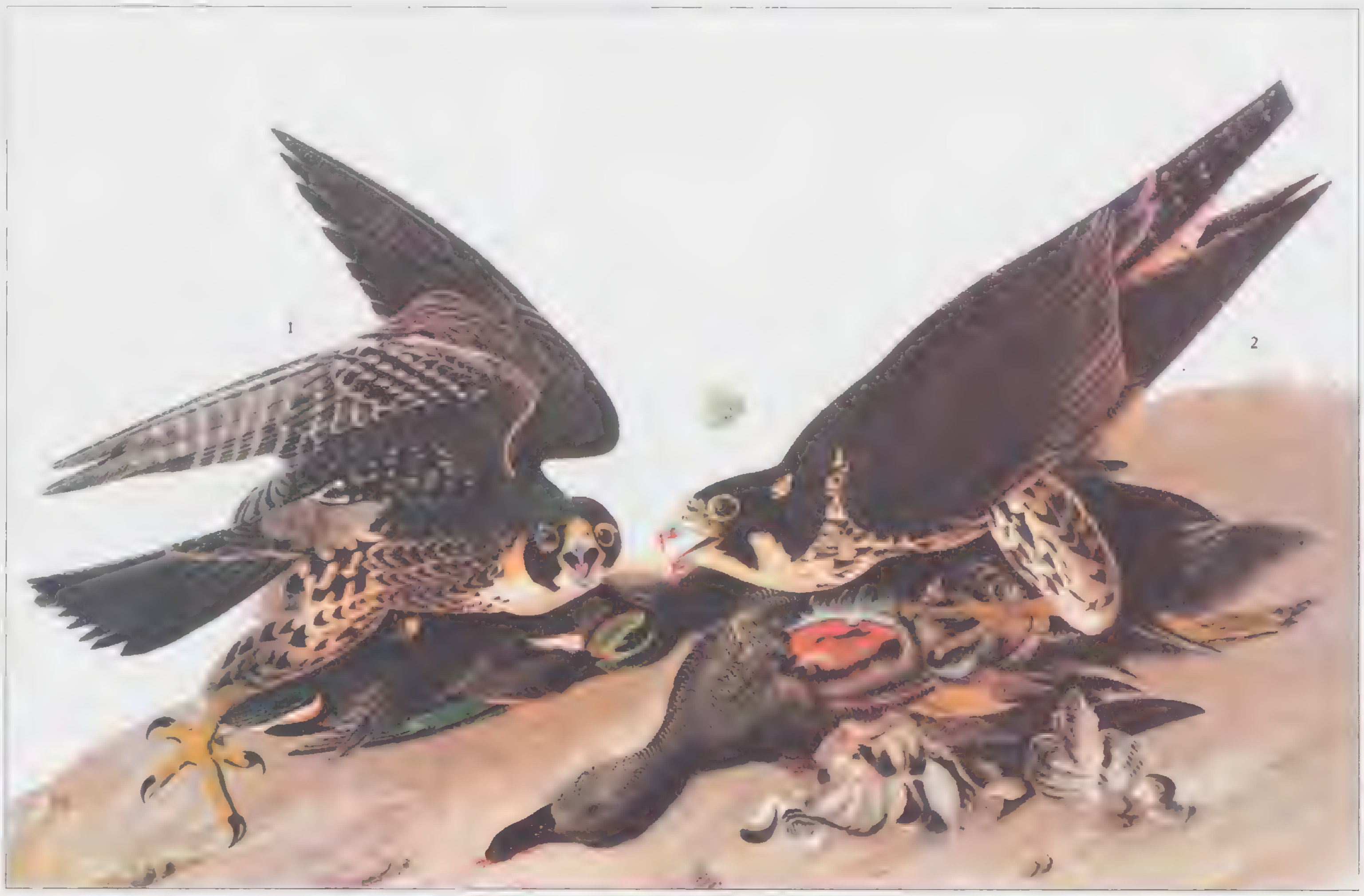
To tell the truth, for a while I was thinking seriously about Blue Jays. Consider the advantages:

- They're in the crow family, which many scientists think may be the smartest bird group. No bird is ever going to earn a Rhodes Scholarship, so it seems to me that every little bit of intellect would help.
- On the other hand, they're not actually crows, with their attendant repu-

tation and conspicuousness, so not as many people are out to gun them down. And they're not harassed so much by kingbirds.

- They're omnivorous, which means, conversely, that I wouldn't have to eat anything I didn't like. Maybe after my transformation a grasshopper would look as good to me as a New York steak does now, but why take a chance? I could live on blackberries and acorns if I wanted to.
- They're semi-migratory, which I take to mean that if I felt like going up to Maine for the summer I could, or if I felt like just lazing around New Orleans or Palm Beach, I could do that. No forced marches twice a year.
- They don't put up with a lot of stuff from anybody.
- They're the first to show up whenever there's any kind of trouble, and they're not afraid to take on just about anything.

As a matter of fact, I have a small scar on my forehead, right at the hairline, courtesy of a Blue Jay whose near-fledgling I was trying to return to the nest some years ago. I was up on a ladder, replacing the lost child, when out of nowhere . . . Pow! I'm lucky I escaped with both eyes and no broken limbs. You have to admire a bird like that.



Great footed hawks by John James Audubon

Let other kids be eagles, I thought, or the vain ones, cardinals. I wanted to be a Duck Hawk.

But something happened the other day that put me off Blue Jays. One of the things I liked was that they didn't seem to give a rat's tail what anybody thought about them. They whoosh into a feeder, scare off all the lovable little chickadees and siskins, and scarf down a dozen sunflower seeds whole, purposefully ignoring the person banging on the window a few feet away. Manners? Propriety? Decorum? Blue Jays don't care. Or so I thought.

Not long ago I was walking home from an afternoon jog when I came upon a pair of jays on the sidewalk. They were doing what looked like a little dance, hopping back and forth and around each other, clucking softly. I assume this is as close to romance as Blue Jays get. It was charming, really. At any rate, they (most uncharacteristically) weren't at all aware of me. I got within five or six feet and stopped to watch them before they suddenly snapped out of their trance, froze, and then bounced up into a small tree, where they hunkered down with a sort of hangdog look that reminded me of Barn Owls. They were embarrassed! They were ashamed that I'd got the drop on them and seen them doing something un-Blue-Jay-like.

I should have known what would happen next. They could have quietly flown away and dropped the matter, but that wouldn't have been the Blue Jay way. Only Blue Jays would try to get out of a spot like this on sheer bluff. You could almost see them pull themselves together, whereupon they started screaming at the top of their lungs, doing their tough-guy, protector-of-the-neighborhood bit, hoping to fool anybody watching into thinking that they (ever-vigilant) had detected a dangerous aggressor (me) in the nick of time and now (as always, ignoring their personal safety) were bravely sounding the alarm.

Come on, guys! I caught *you*! Can't you just accept it and laugh and go on? Besides, who's around in this neighborhood for you to warn? Starlings and squirrels? Since when did a Blue Jay ever care about starlings and squirrels?

The sin of pride is a dreadful failing. It makes you do stupid things. The fact is, those jays didn't care about the starlings and squirrels; they weren't trying to fool them. They didn't care about me, either. Those Blue Jays were trying to fool themselves.

So Blue Jays are off my list. Still, I think I was onto something with the crow family. It takes a pretty smart bird to learn to dissemble like that. Maybe I just need to change my criteria a bit. Maybe the problem with Blue Jays is that they've been around civilization too much, picked up too many human traits.

Have you ever been to the Colorado Rockies? Way up in the mountains where the Engelmann spruces frame the blue glacial tarns? Have you ever been there in September, on the cusp of the seasons, when the aspens are turning and the atmosphere seems as transparent as the moon's?

Lately I've been thinking seriously about Clark's Nutcracker. ■

In the Field

A LESSON FROM MOTT'S CREEK

by Jack Connor

Taking time to delight in the simple pleasures of birding

Binoculars trembling in my fingers, tears in my eyes from the January glare, face stiff from the hard wind, I am standing between Brian Sullivan and Jerry Liguori and wondering, "Why don't I come out here every single day?"

For years I thought of the Mott's Creek salt marsh, three miles from my house, as just one of the better local birding spots. The vista is pretty—a long line of oaks on the upland side, *Spartina* grasses leading out to hammocks of cedar and pine on the horizon—and I could usually spot a few harriers here and a red-tail or two.

Now, thanks to my companions, I have a very different understanding of this place.

"Is this another adult golden?" asks Brian.

"I think maybe dark-belly bald," says Jerry.

"Where are you two looking?" I ask.

"Up in the blue, pretty far out," says Brian. "It's only a dot."

"It's a smudge," says Jerry.

"It's invisible," I say.

"The wings are bowed like a golden's, Jer."

"But look how big the bill is, Bri."

Brian Sullivan was a student of mine, and a beginning birder, only three years ago. He says now my course turned him on to birds, but the truth is *birds* turned him on to birds. He liked to leave at the five-minute break halfway through class and head off to Brigantine Refuge, six miles down the road. Or he'd skip the first half of class and show up at the break with a gull feather or a fragment of eggshell he wanted identified. One day he appeared with a dead warbler he'd found next to one of the library's windows. I showed him that the streaked throat and yellow eyeline meant it was a Northern Waterthrush. "Thanks," he said, "I'm really learning a lot in this course." "Well, then," I said, "I'm glad you could make it for the second half of class today, at least." When the other students reassembled, however, his seat was still empty.

JACK BARRIE

"A fews moments later, Brian points out a Bald Eagle above the nearest hammock."

The next day I found him in the hallway. Brian is six-foot-two, thin, and handsome, with long blond hair under the obligatory baseball cap. "I went out to the refuge after class yesterday," he said, "and saw three red-tails, two sharpies, five Turkey Vultures, and about a dozen harriers. It was great!"

"That wasn't after class you saw those birds. That was *during* class."

"Sorry," he said, smiling his winningest smile. "I couldn't wait to get out there."

I met Jerry Liguori late that same fall at the Avian Rehabilitation Center in Seaville, when he gave me a tour of the facility. Jerry said he'd been working with sick and injured birds since graduating from college a couple of years earlier. He has the body of a linebacker, but his voice is high-pitched and light, and as he led me from cage to cage he spoke so quietly I had to step close to hear. I couldn't tell whether he was discouraged by his surroundings or simply shy.

He knew the story of each bird: the one-legged Herring Gull's diseased foot had been amputated, the Great Blue Heron had lost its wing striking a power line, the two Oldsquaw ducks had been found in an oil slick by a local fisherman, the three Red-tailed Hawks had each been crippled by gunshot. Jerry said that he was getting more interested in bird watching and asked what binoculars I'd recommend. "I want to get out in the woods and learn more about healthy birds, living in the wild," he said.

That January, when Brian first claimed that he'd seen four different

Golden Eagles in a single day at Mott's Creek, I dismissed it. In 10 years of visits there, I had seen only two Golden Eagles ever—and I had never heard of anyone seeing four in one day anywhere in New Jersey. He had probably misidentified the same Bald Eagle four different times, I decided, or let his imagination work on some Turkey Vultures. When Jerry called soon after to say he had his new binoculars and he'd found a Great Horned Owl nest, with an adult on eggs, I figured it was beginner's luck.

Brian called back a week later to say he'd had the four goldens again at Mott's Creek, this time all in sight simultaneously. Jerry soon found another owl nest, two miles from the first. "There's a little chick in this one," he said.

The next I heard they had encountered each other at Mott's Creek. "I met a fellow from your class," Jerry told me. "He was looking at a couple of Golden Eagles. He said they were both adults, I said one was an immature. We were at each other's throats immediately."

In the two winters since that meeting, Brian and Jerry and a few of their friends have kept an informal, almost-daily hawkwatch on the salt marsh and have proven something I still find startling: Mott's Creek is a major wintering site for Golden Eagles—the best place in New Jersey to see this rare western species, and perhaps the best place anywhere on the East Coast.

But documenting an avian phenomenon is not what these young men are after. What attracts them is the physical pleasure of standing in the wind under a cold sky, and the simple satisfaction of watching a distant dot become a recognizable bird overhead. It's the kind of birding I've drifted away from in my middle age: birding without a purpose—for the sheer joy of it.

They keep stopping by the house, asking me to join them, and no matter what excuse I give—I have papers to grade or one of my kids needs a ride somewhere—they are not discouraged. A few days later they stop by again. "Yesterday we had two goldens, three balds, and a male harrier. *Come on!*"

This morning I hoped to surprise them by beating them to their rendezvous. At dawn the kitchen thermometer registered six degrees Fahrenheit, and the radio weatherman said it would be the coldest day of the year, with a strong northwest wind and wind chill in the negative numbers. Even a stick-in-the-mud knows that's when eagles fly. I layered up—thermals, wool socks, wool sweater, best gloves, heaviest boots—and left the house at 8:15. I'd beat them to the creek by half an hour, I figured. By the time they arrived, maybe *I'd* have something to tell *them* about for a change.

"You haven't missed much," said Brian, when I pulled up in my car, "one adult bald and a light-phase rough-leg."

"Yeah," said Jerry, "and two Short-eared Owls we had at first light."

By noon we have seen at least seven different eagles: one adult golden, two immature goldens, and four Bald Eagles. When an eagle swings low, mergansers, Buffleheads, and Black Ducks rise from the marsh in front of us as if a gun has been fired. An adult Golden Eagle swoops across the grass, chasing a flock of Black Ducks, and the Great Blue Herons nearby—six, seven, eight, ten, twelve great blues—come flapping out of the brush, *gronk*ing in complaint.

A few moments later, Brian points out a Bald Eagle above the nearest hammock, and I find it in my binoculars just in time to witness something I have seen before only in textbook diagrams. The bird tucks into teardrop position, gains momentum in a straight descent, then opens its wings, swoops upward, rolls over on its back, and completes a reverse loop-the-loop. Then, as if to be sure we have noticed, it repeats the whole sequence again. And again. Three over-the-back roller-coaster loops in less than a minute.

"Wow!" I say. "Can you think of any place in South Jersey, any place in *North America*, you'd rather be than right here?"

"Not me," says Jerry. "This is the best . . . . Rough-leg coming, high over the pines."

"Yeah," says Brian, "a dark-phase. My favorite."

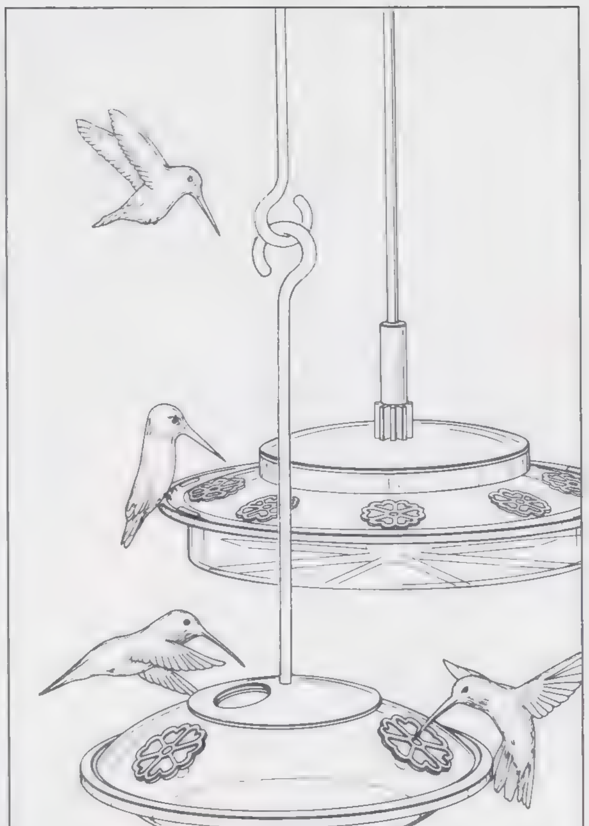
"Where are you two looking?"

"It's a dot," says Jerry.

"A smudge," says Brian.

"Looks like it's missing a wing feather, Bri."

"You're right, Jer. Which one is that—the seventh primary?" ■



Mmm hmmm!

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Doctor Birdseed

by Peter Stangel

Biologist Aelred Geis's ground-breaking studies provide the best information to date on which seeds birds prefer

The House Finch's behavior perplexed me. Through my kitchen window I watched as it methodically extracted one sunflower seed after another from my feeder, rotating each seed rapidly in its bill like a person mouthing food that's too hot. It would eat two or three seeds in a row and then, for no apparent reason, drop one to the ground. To my chagrin, the main beneficiary of this behavior was a squirrel that squatted beneath the feeder, reaping the bounty from above.

Al Geis, left, fills one of the many feeders on his Maryland property. Geis's backyard studies have revealed most of what we know about wild birds' seed preferences.

PETER STANGEL.

Why did the bird eat some seeds while dropping others? After all, they were black-oil sunflower seeds, supposedly the food of choice for many backyard birds, including House Finches. Perhaps the finch was rejecting moldy seeds or ones infested with insects, I thought. Or perhaps some seeds fell as the finch maneuvered them in its bill. With black-oil sunflower seed priced at $17.50 a bag, I felt I deserved an explanation for the finch's finicky behavior.

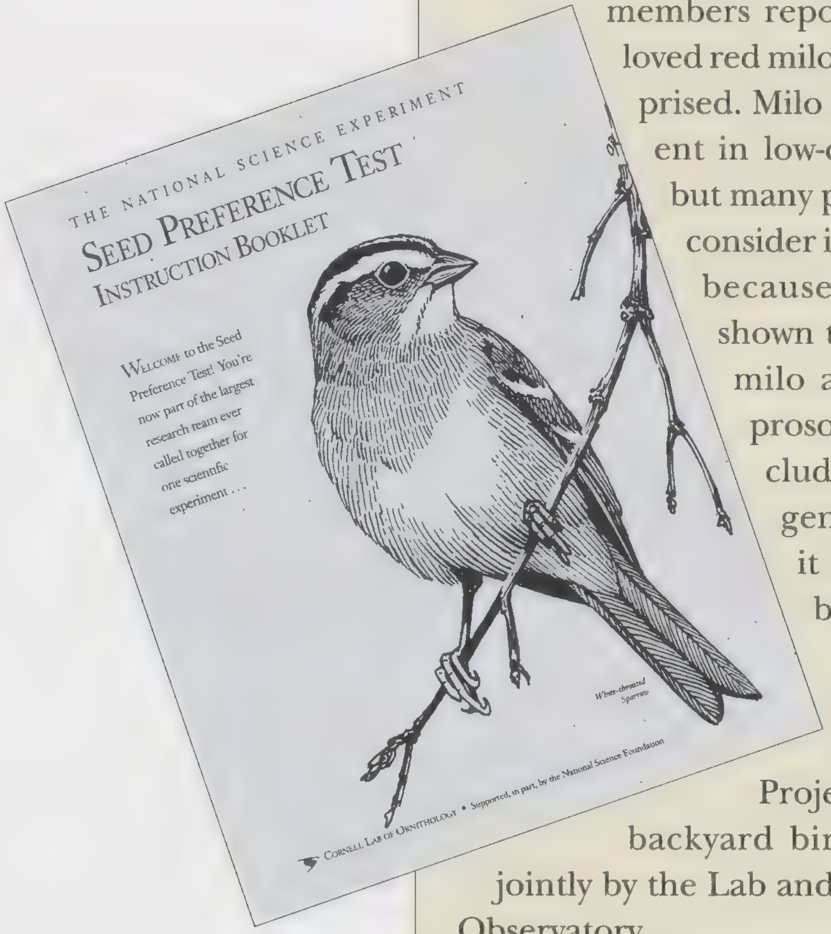
The explanation, according to Aelred Geis, is that the bird was only interested in seeds of a particular size and shape. He should know. A retired U.S. Fish and Wildlife Service (USFWS) biologist, Geis has spent more time studying wild bird seed preferences than anyone else. After measuring thousands of rejected seeds, Geis found that House Finches and some other seed eaters preferred oil sunflower seeds that were heavy, small, and plump.

Geis provided this insight during an intriguing phone conversation that led me to visit his home in Howard County, Maryland, where he has studied bird food preferences for a decade and a half. At breakfast in a kitchen warmed by a wood stove, Geis recalls how he learned that seed size and shape were important to feeder birds.

"My initial experience with size preference was out there," he says, gesturing to a large tube feeder hanging outside the kitchen window. "A remarkable thing happened. I was testing tube feeders to see which models birds preferred. All of a sud-

A New Seed Preference Test

Aelred Geis's seed-preference tests provide the best available information on what seeds birds like best. His findings are considered authoritative by many ornithologists. Most bird seed preference charts, including the one distributed by the Cornell Lab of Ornithology, use Geis's research as their source.



The National Science Experiment

Seed Preference Test

Instruction Booklet

Welcome to the Seed Preference Test! You're now part of the largest research team ever called together for one scientific experiment . . .

White-throated Sparrow

Cornell Lab of Ornithology • Supported, in part, by the National Science Foundation

So a couple of years ago, when some Lab members reported that their birds loved red milo, Lab staffers were surprised. Milo is a common ingredient in low-cost bird seed mixes, but many people who feed birds consider it useless. Why? In part because Geis's studies had shown that no species found milo as attractive as white proso millet. He had concluded that "in view of its general unattractiveness it probably should not be used."

We heard a different opinion from some participants in Project FeederWatch, the backyard bird count conducted jointly by the Lab and the Long Point Bird Observatory.

Ralph Fisher of Silver City, New Mexico, says that he has been feeding birds in New Mexico for more than 25 years, that he supplies milo almost exclusively, that all the people who feed birds in his region use milo, and that over the years he has observed at least 52 species of birds eating milo.

Sally Hoyt Spofford of Portal, Arizona, concurs: "In February of 1972, when we first came [to Portal] to spend about four months, I brought 50 pounds of cracked corn, which my Etna [New York] birds loved. The birds would not touch it, and a neighbor told me they wanted milo. Now I use between 600 and 800 pounds a year, and that is peanuts to what some use. A friend in the next mountain range east uses several tons a year—he even has the rare Montezuma Quail coming for it. I've never kept track of the birds that eat mine, but I know they include towhees, juncos, cardinals, jays, Pyrrhuloxias, doves, quail, House Finches, and various sparrows including Lincoln's. And, when we're birding in winter, we always check milo fields, as that is where we will find the birds—eating the milo that fell to the ground when harvested."

Why did these folks contradict Geis's findings? One possibility: Southwestern birds have different seed preferences than birds in other areas. Although Geis had expanded his original studies to include tests in California, Ohio, and Maine, he had no study sites in the Southwest. Could there be regional differences for which Geis was unable to test?

This question helped to launch the Cornell Lab of Ornithology's National Science Experiment/Seed Preference Test. Lab educators had been looking for a good question to test the National Science Experiment concept, which is that people can contribute to the field of ornithology and learn about the process of scientific investigation by participating in actual bird research. The case against red milo seemed perfect. It was likely to interest thousands of backyard bird enthusiasts, and it intrigued the Lab's population biologists. Furthermore, the birdseed industry wanted to know the truth about this mysterious red seed.

By March 1994, the experiment was in full swing. Owing partly to excellent reporting on ABC's "Good Morning America," more than 17,000 backyard birders were testing their birds' preferences for black-oil sunflower seed, white proso millet, and red milo, using an experimental design carefully developed by Lab biologists. Although just a handful of data sheets had been returned, they revealed some fascinating results. Some birds, such as American Tree Sparrows, were definitely more interested in red milo than ornithologists had expected. Regional differences in seed preferences did seem to be surfacing. And, participants seemed pleased and excited to be directly involved in Lab research.

The final results of the Seed Preference Test will be published in the Autumn 1994 issue of *Birdscope*. Meanwhile, Lab staffers applaud Mr. Geis for his groundbreaking research on this topic. Without his studies, the Lab's Seed Preference Test might never have been started.

—Rick Bonney

den the price of oil sunflower seeds went down and, lo and behold, the birds really liked this cheap seed—because it was small. By industry standards it was not very high quality seed, but by bird standards it was just right."

Geis confirmed his observation by individually examining seeds discarded by birds. He placed containers beneath feeders in his yard and collected seeds rejected by finches, chickadees, and others. He sorted seeds using screens of differing mesh size, carefully measured and weighed a sample from each group, and then compared these with seeds taken right out of a new bag. The result? Birds were rejecting large, lightweight seeds in favor of small, heavy, plump seeds.

Geis's interest in seed preference began when the USFWS assigned him the task of starting an urban wildlife program. "That was about 15 years ago," says Geis. "I got into urban bird feeding because of the tremendous opportunities for environmental education, like teaching people the need for habitat. I soon realized that nothing was known about the relative attractiveness of different bird foods. The public deserved to know more about how to feed birds."

Geis's 20-acre farm, a few miles north of Washington, D.C., was an ideal spot for feeder studies. "This property has a rich bird population," he says, "and it's convenient." The farm's greatest asset, however, was the availability of an excellent field assistant—Geis's mother, Leitha.

Leitha Geis lives in a cozy home nestled in the woods a short distance from her son's house. Visitors quickly realize that this is no ordinary home. Outside Leitha's kitchen and living room windows you can see an array of feeders being used for various experiments. From the comfort of her living room, Leitha has spent hundreds of hours recording the seed preferences of neighborhood birds. Geis estimates that Leitha, who began helping him on this project when she was 70, has made nearly half a million observations on birds' seed preferences.

Geis's first seed preference study was aimed at determining the relative attractiveness of 22 different food types compared to black-striped sunflower seeds and white proso millet. Geis chose these two as standards because both are commonly used and most feeder bird species find one or the other attractive.

The results of this project provide the basis for much of what we know about which seeds backyard birds prefer. Armed with Geis's data, you can design a custom feeding program to attract, or discourage, particular species. For example, Geis discovered that whole peanut kernels are the most attractive feed for Blue Jays. Black-oil sunflower seeds were only one-fifth as appealing to the jays as black-striped sunflower seeds, suggesting that omitting peanut kernels and providing black-oil sunflower seeds in place of other varieties would be a good strategy for people who wish to discourage Blue Jays.

Geis published the results from this research in 1980 as Special Scientific Report No. 233, "Relative Attractiveness of Different Foods at Wild Bird Feeders"—the most popular technical report ever produced by the USFWS. The report's popularity is no surprise to Geis. "More people feed birds than hunt and fish combined," says Geis, referring to a 1985 survey indicating that over 60 million people in the United States feed birds.

AELRED GEIS

Geis and his premier research assistant, mother Leitha Geis, survey the feeders outside her living room window. Birdseed companies have used the team's findings to shape their product lines, according to Geis, who says, "Most of the biggest names in the bird feeding industry have sat right here in this room."

Special Report No. 233 was just the beginning for Geis. When critics suggested that his seed preference results might have been peculiar to Maryland, Geis expanded the research to include sites in California, Ohio, and Maine. Data from these sites not only supported his original findings, but revealed that individual species exhibited the same seed preferences throughout their ranges.

Over the years, Geis's research has led him to challenge some of the "golden rules" of bird feeding. For example, how many backyard bird watchers provide food every day, fearing that an empty feeder will cost some poor, feeder-dependent bird its life? I certainly fall into this category, even going to the extreme of having a neighbor fill my feeders when I have to be away from home.

"That's ridiculous," Geis booms over the din of five barking dogs that have joined our kitchen table chat. "Man is very egocentric—he likes to think he is more important than he is. Most birds range over a large area and get their food from a variety of natural and human-provided sources."

PETER STANGEL

Geis used this four-part feeder for his seed preference tests. He compared two "standard" seeds—black-striped sunflower and white proso millet—to a variety of other seeds.

Geis first questioned bird dependence on feeders when he tried to estimate local bird populations. In the case of the House Finch, for example, Geis banded over 1,200 birds one summer, but observed that only one House Finch in five at his feeders was banded, suggesting that the local population was five times as large. By calculating the energy requirements for an individual finch and multiplying by the estimated population size, Geis quickly realized that the seed he was providing was not nearly enough to sustain the local finch population. The birds were clearly getting additional food from other sources.

Stanley A. Temple of the University of Wisconsin and his student Margaret Brittingham, now an assistant professor at Pennsylvania State University, reached a similar conclusion independently. In an intensive study of feeder dependence by Black-capped Chickadees conducted in Wisconsin, Temple and Brittingham found that most chickadees obtained only about 21 percent of their daily energy requirements from feeders. The researchers concluded that the birds they studied depended primarily on natural foods, using feeders merely to supplement their diets.

So we can skip filling our feeders on an occasional weekend or two without harming the birds. Geis's work, as well as the research conducted by Temple and Brittingham, suggests that birds are not quite as dependent on us as we think they are—with one caveat: Temple and Brittingham found that during periods of extreme cold, chickadees with access to feeders had a greater chance of surviving than those without a supplemental food source.

Another golden rule that Geis helped to debunk concerns the relative merits of seed mixes. Many consumers think that the more kinds of seed a mix contains, the more bird species you'll attract. Not true, says Geis. "There are one or two dominantly attractive foods, and you accomplish little by feeding more than that." Geis found that many common seed mix ingredients, such as sorghum, wheat, and corn, are much less attractive than other seeds to birds.

Geis takes his criticism of mixes a step further. "It is almost impossible to produce an ideal mix because the species present change from place to place, and from time to time at the same place," Geis says. "Different species also feed in different ways and in different places, like on the ground or on feeders. When you mix a seed preferred by ground feeders with a seed used by birds that like to eat from elevated feeders, you've got a problem."

Geis's solution? Put preferred foods in the preferred feeding places. He recommends, for example, using white proso millet on the ground for sparrows, juncos, doves, and other ground feeders, and black-oil sunflower seed in elevated feeders for chickadees, finches, and the like.

Although most retailers have been reluctant to eliminate the tremendously popular seed mixes from their shelves, Geis's research has influenced the ingredients used in mixes. "We used Geis's recommendations to blend our premium seed mix," says Jane Crowley, director of communica-

GORDON VICKREY

tions for Wild Bird Centers, a retail chain. "We even named the mix after him."

Unfortunately, not every bird seed distributor knows or cares about Geis's recommendations. Several of the primary ingredients in the seed mix sold at one of my local Virginia supermarkets are at the bottom of the preferred food list Geis compiled. Geis fears that when novices purchase these low-quality mixes, they might become discouraged by the lack of results at their feeders. This is almost unbearable to Geis, who, since retiring from the USFWS in 1987, spends considerable time educating consumers about bird food preferences. As director of research for the Wild Bird Centers, Geis writes a column in the company's newsletter that reaches thousands of bird feeding customers.

After breakfast, Geis takes me on the short walk down to his mother's house. Inside, we settle in front of her living room window, where the view is enough to warm the heart of any ornithologist—or seed salesperson. A steady procession of Northern Cardinals, Black-capped Chickadees, Tufted Titmice, White-throated Sparrows, and other species dart out of nearby shrubs to snatch seeds from the dozen or so feeders outside the window. As we watch, Geis and his mother trade stories about their experiences.

"Many of the biggest names in the bird feeding industry have sat right here in this room," Geis says as we watch birds swarming at the feeders. "It's kind of ironic that my little one-horse operation has generated so much of the data that exist, and we're talking about a billion-dollar business," he says.

Ironic, perhaps, but certainly not surprising, given Geis's interest in and commitment to urban wildlife issues and public education. Reflecting on his career, Geis says, "If nothing else, I feel good that I have helped people enjoy birds and bird feeding more"—a clear understatement, and certainly not a full representation of Geis's many contributions. It is, however, an accurate reflection of how Geis views his mission: helping people to enjoy birds and other urban wildlife. ■

LEONARD LEE RUE III

A Northern Cardinal, below left, eats a striped sunflower seed. Geis found that many bird species are more attracted to small, plump, black-oil sunflower seeds.

Geis's studies also debunked the notion that seed mixes such as the one this Dark-eyed Junco is eyeing, above, attract a variety of birds. He says it's best to offer the most appealing seeds in their pure form, but in a variety of places—on the ground and in different feeders.

Peter Stangel is director of the Neotropical Migratory Bird Conservation Program at the National Fish and Wildlife Foundation.

BIRDING *by the* BOOK

by Jane E. Hardy

A guided tour through Cornell's Hill Ornithology Collection

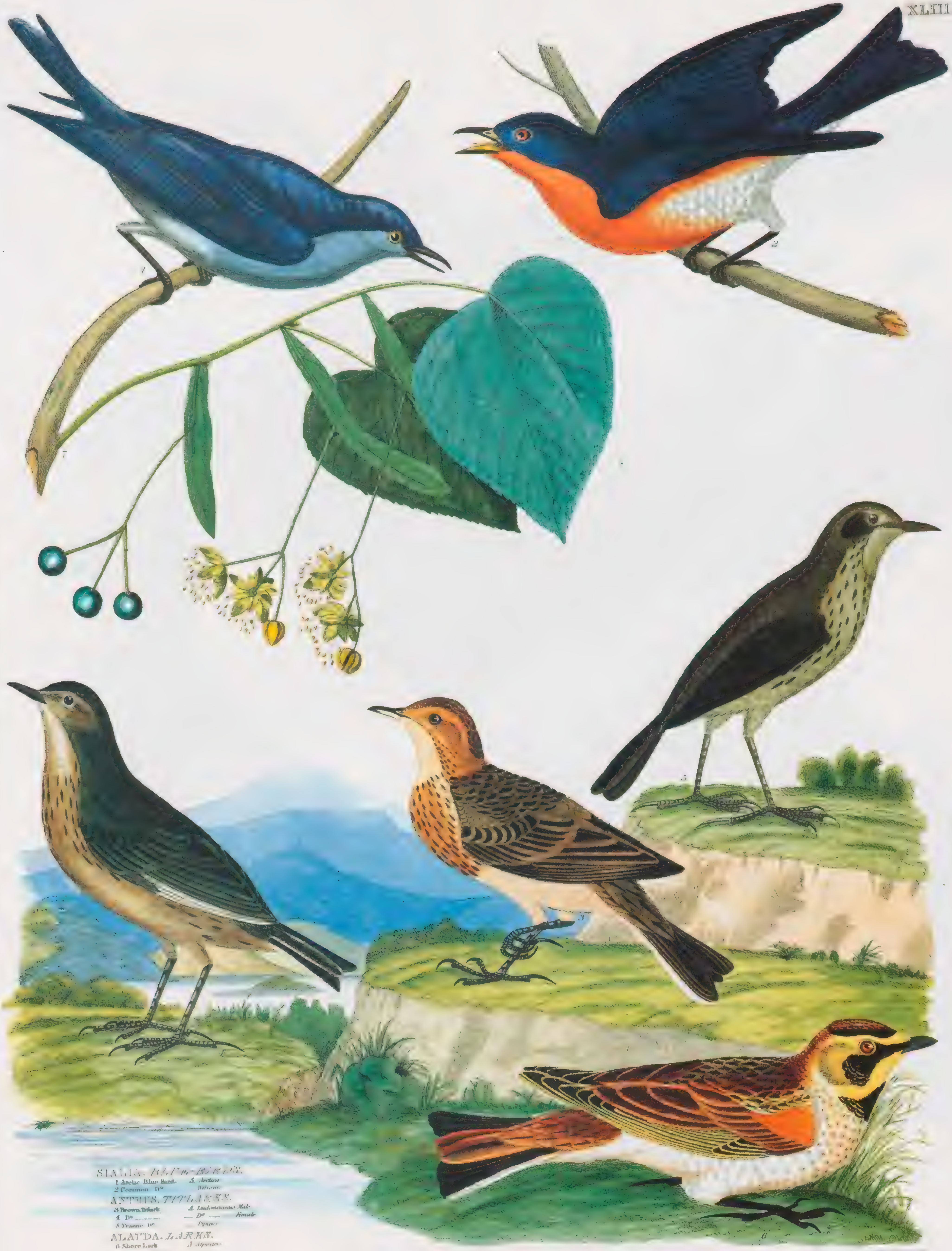
It's a blustery, snowy day as I walk through the doors of Cornell University's Olin Library. I'm going birding indoors—in the Hill Collection of ornithology books. Past Olin's bustling front desk and the reference area is the entrance of the Carl A. Kroch Library, where the collection is located. My steps echo on the slate floor, then the library quiet takes over. The elevator glides silently to B2, the lowest level, and leaves me in the circular reception area of the newest of Cornell's libraries. The gray-green carpet, the rose walls, and the blue Brazilian granite sculpture in the middle of the rotunda are bathed in a glow of light.

Margaret Rogers, the assistant curator of the collection, greets me softly in the main reading room. The oak chairs and light gray tables are lit from above with ingeniously arranged mirrors and skylights that belie the library's underground location far below the Arts Quad's snowdrifts. On a table corner Margaret has gathered her notes and a copy of *Ornithology Collections in the Libraries at Cornell University*, the descriptive guide by retired librarian Jeanne A. White that will be our starting point.

The Hill Ornithology Collection is part of Cornell's History of Science Collections, all of which are housed in the Kroch Library. These collections number some 35,000 volumes and include such rare items as medical dissertations dating from the late 16th century.

The Hill Collection is a gift of Kenneth E. and Dorothy V. Hill and includes many volumes from their personal collection of ornithological books. Kenneth Hill, a retired businessman, has a longstanding interest in ornithology and birding. He had been collecting rare books for several years when in 1971, after taking a one-week summer course taught by Peter Paul Kellogg at the Cornell Lab of Ornithology, he and his wife Dorothy began to consider contributing volumes from their private collection to Cornell, to be combined with

"Blue Birds," from *Illustrations of the American Ornithology of Wilson and Bonaparte*, by Thomas Brown.



SIALIA. *BLUE-BIRDS.*

1 Arctic Blue Bird. *S. Arctica*
2 Common D° *Wilsonii*

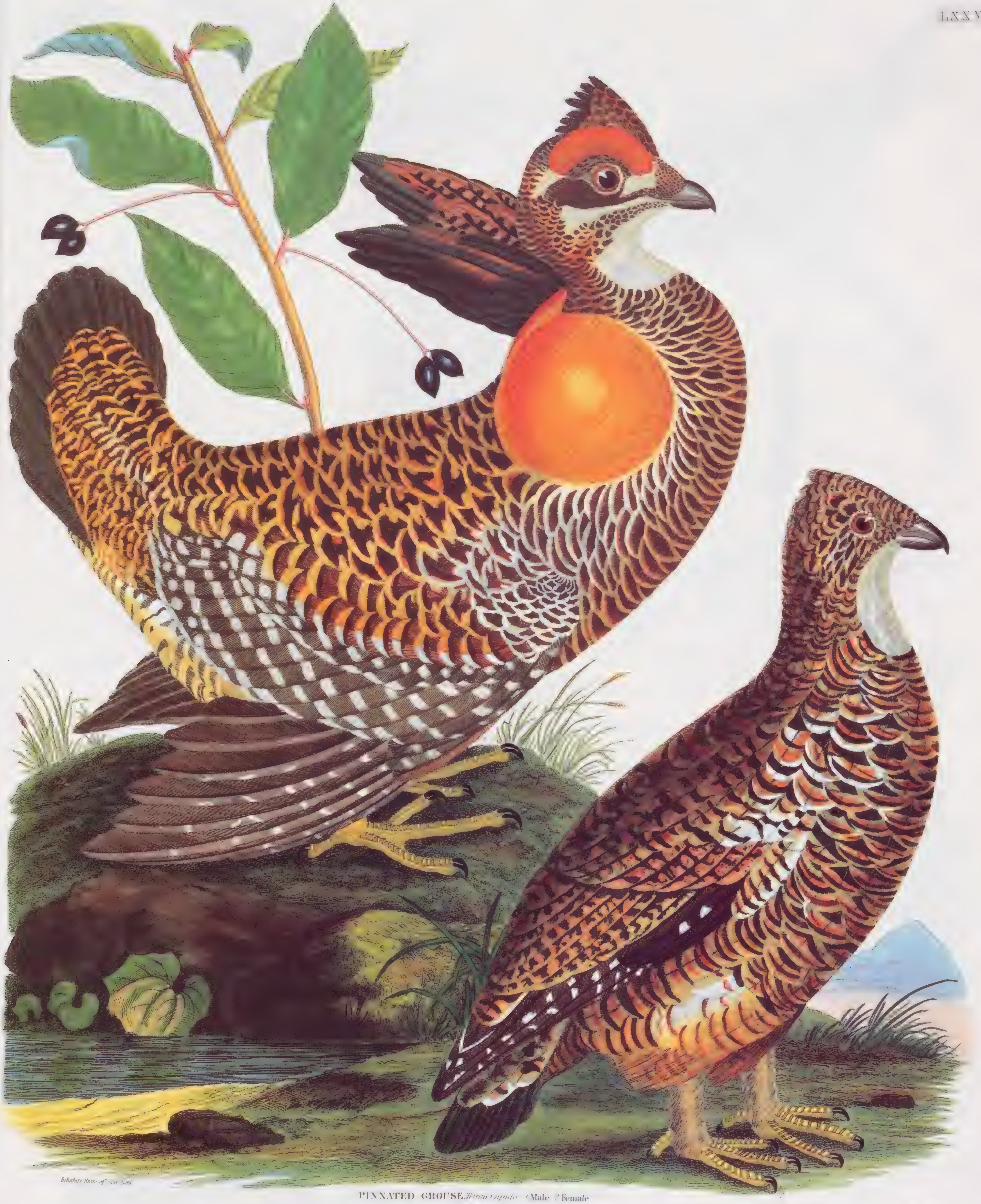
ANTHUS. *TITLARKS.*

3 Brown Titlark *A. Ludovicianus Male*
4 D° —— *— D° —— Female*
5 Prairie D° *— Pipiens*

ALAUDA. *LARKS.*

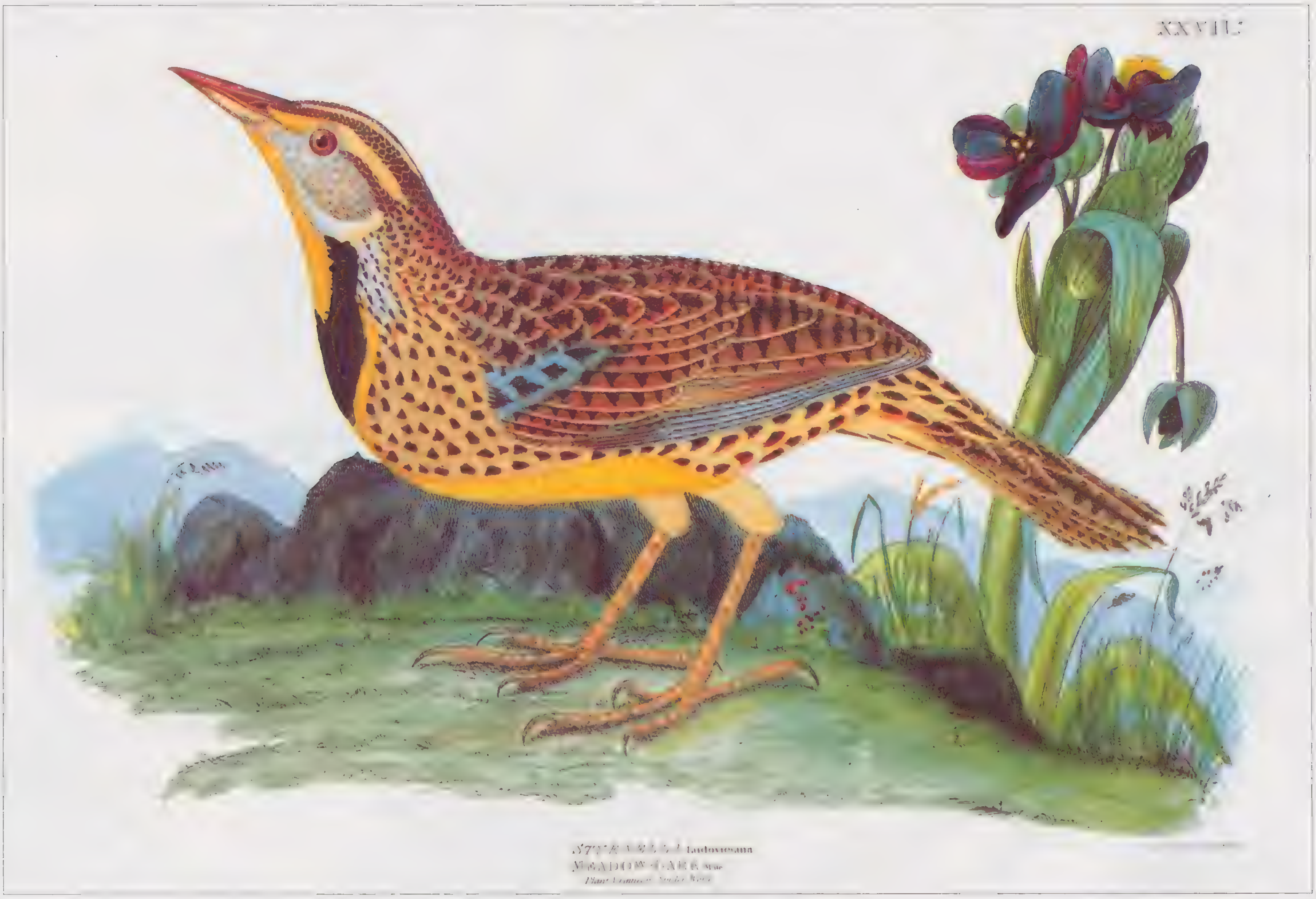
6 Shore Lark *A. Alpestris*
7 *American Lime*

LXXV.



Inhabits State of New York

PINNATED GROUSE. *Tetrao Cupido* 1 Male 2 Female



In the early 19th century Captain Thomas Brown painted these delightful images—"Meadowlark," above, and "Pinnated Grouse" (Greater Prairie Chicken), left—for the book Illustrations of the American Ornithology of Wilson and Bonaparte.

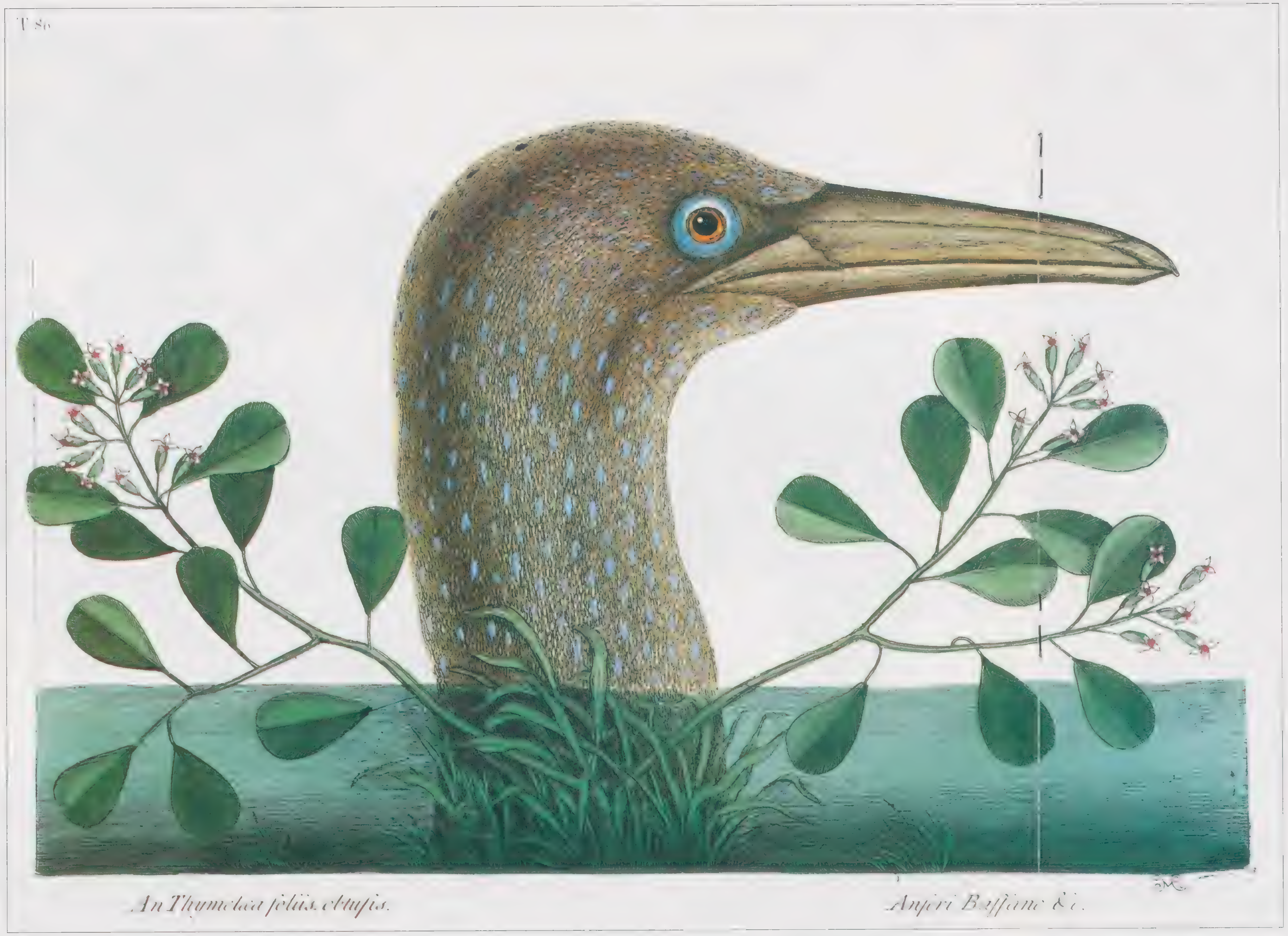
the extensive ornithological collections already at the university. Their daughter Meredith, Cornell class of 1971, and son Jonathan, a rare book dealer, agreed. The Hills formally transferred the 34 titles (in 66 volumes) to Cornell in September 1984, although the volumes were not actually added to the collection until January 1988.

"The number of volumes doesn't begin to indicate their extraordinary historical significance, as they document the development of ornithological publication," said David Corson, director of Cornell's Olin, Kroch, and Uris Libraries and curator of the History of Science Collection.

Although the emphasis in the Hill Collection is on books about North American ornithology published before 1900, Cornell's ornithology holdings are much broader. They include an archival collection of the papers of 25 leading ornithologists, Mann Library's extensive collections of late 19th- and 20th-century ornithology publications, and other works housed at the Cornell Lab of Ornithology. These combine with the Hill Collection to make a significant assemblage of materials on birds. Some books in the Hill Collection itself include birds from other parts of the world; many were published in Europe where the fine art of lithography and the talents of artists in hand coloring led to beautiful representations of the world's most colorful avian inhabitants. The Hill Collection now includes more than 500 volumes; Cornell's ornithology holdings are considered one of the premier academic ornithology collections in the country, according to Corson.

It's not a collection that's standing still, either. The endowment fund created by the Hills allows the curators to actively add books as they become available. The current desiderata list numbers more than 100 items, with priorities established for each. The prices of rare books have gone up rapidly with inflation, so adding to the collection has become a progressively slower process. David Corson is always looking for books for the collection. Because of the quality of Cornell's ornithology holdings, other donors have been attracted to it.

Margaret Rogers's enthusiasm about the collection is contagious. "The books are beautiful, and we hope people will use them more. When they do, we get a chance to see them too," she says. Rogers has been associated with the History of Science Collections since 1985 and with the Hill Collection since it arrived at Cornell; the collection moved to the newly constructed Kroch Library in 1992. The library is kept at a constant 68 degrees Fahrenheit, and humidity is controlled to produce the ideal conditions for rare books.


T 86
An Thymelaea foliis obtusis.
Anſeri Baſſano &c.

The shelves were designed to fit the collection, which includes many large volumes. Space for projected growth of the collection has been provided. The treasures are well preserved.

And what treasures. You could come for reasons of pure aesthetics, to enjoy the beauty of colored plates in books whose covers—crimson or emerald leather with gold tooling—are works of art in themselves. Or you could come for any of a number of scholarly pursuits. Students in the university's ornithology courses visit regularly, and a graduate student recently used the collection's resources for a dissertation on ornithology in the 19th century—an era of exploration and observation that laid the foundation for today's study.

Art historians can use the collection to trace the evolution of bird art, from stiff and sometimes unnatural poses to increasingly accurate depictions. Artists will be intrigued by hand-colored lithographs in which the throat of a hummingbird glows with luminescent green-gold and an apparent iridescence. (The colorist probably layered transparent colors and covered them with Japan lacquer, or possibly gum arabic in solution, to produce a shiny surface.) The effect is so lifelike you expect to be able to feel the feathers on the hummingbird's throat, but of course you won't try.

The artist-historian interested in wood engraving will want to study the work of Thomas Bewick (1753-1828), the man for whom the Bewick's Wren is named. His small, detailed, accurate prints of birds are found in *A History of British Birds*, published in 1797. The small volume presents birds in order of their appearance in spring in Britain, starting with the Wryneck in mid-March and concluding with a flycatcher in mid-May. Bewick's book shows wood engravings brought to a fine art.

Ornithologists can use the collection to trace the history of avian systematics, the process of classifying birds into related groups. Some of the earliest writers decided that an alphabetical listing would be sufficient to express the way bird families were related. In the 17th century, Francis Willughby and John Ray tried to solve the puzzle of bird relationships by looking at structure, function, and morphology to create the first major classification system for birds. Researchers today consider their system to be the start of scientific ornithology in Europe. Three books that detail the progress of their ideas are part of the Hill Collection.

It's also interesting to trace the changes in bird names. What we today call "common names" were used, without much attention to duplication or confusion, until Linnaeus introduced the system of binomial nomenclature in the 18th century to classify living creatures. This method, which names birds by genus and species, is still in use today.

How do you actually see these wonderful volumes? Some of the most fragile, such as Charles Lucien Bonaparte's *American Ornithology, or the Natural History of Birds Inhabiting the U.S.*, are protectively boxed; so are unbound volumes, to keep the corners of the pages from getting bent. If you wish to look at these you must be especially careful. Most volumes, however, are easy to examine.

The process is simple. You check the catalog for the titles of books you'd like to see, fill out request slips, and turn them in at the security desk. The librarian telephones your request to the vault, and someone brings your books in about 15 minutes. The exception is John James Audubon's "double elephant" folio. It's about four feet by three feet and requires special handling, since turning the pages risks damage to the binding. You must make an appointment a day or two in advance if you wish to see it.

Just looking at the books will, of course, not be enough for many visitors. Reference volumes can expand your understanding of the writers and artists and the techniques they used. Waldemar Fries writes about Audubon in *The Double Elephant Folio: The Story of Audubon's Birds of America.* Read it before you look at the Audubon books to enhance your experience with the work of this most famous of bird artists. Or look through the volumes of British naturalist George Edwards's *A Natural History of Uncommon Birds* and *How to Draw and Paint in Watercolor and Etch on Copper (1743-1751)* if you're interested in how the drawings were reproduced. Other reference books are available in both the library's main collection and the Hill Collection.

Finished with the preliminaries, Rogers and I walk to the rare book reading room. In the anteroom I check my coat and briefcase into one of the lockers beside the desk. Only pencil and paper can go with me as I examine the books. Free of contamination, I take the cart of books from the vault into the skylit reading room. Each book rests on a dark gray foam holder, angled

82
BRITISH BIRDS.
BRITISH BIRDS.
83
THE CHATTERER.

To see wood engravings brought to a fine art, check out Thomas Bewick's A History of British Birds *(shown below, his illustration of a Cedar Waxwing).*

The Hill Collection also features such works as Mark Catesby's Natural History of Carolina, Florida and the Bahamas Islands. *Art historians say his works foreshadow those of John James Audubon. Above left, Catesby's painting of a "Great Booby" (actually an immature Northern Gannett).*

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to support the binding. I put on white cotton gloves to keep oil and perspiration from my hands away from the pages. A white weighted "shoelace" waits on the table, to hold the pages open without bending the books' bindings. Only the rustle of turning pages and a few whispers break the silence. I feel the magic of these books and allow myself to be carried into another time and place. Here are some of the volumes I looked at.

Alexander Wilson, often called the "Father of American Ornithology," published *American Ornithology* in nine volumes from 1801 to 1825; the work was revised and reprinted for many years. Beautiful copies of the first and second printing of the first edition are included in the Hill Collection. The plates in the "Jameson edition" of *American Ornithology* and in *Illustrations of the American Ornithology of Wilson and Bonaparte* are illustrated by Captain Thomas Brown. Brown's work uses brilliant colors—note the blues and greens—and presents the birds against natural backgrounds that give a sense of depth and setting. Look for the tupelo tree with butterflies, eagles, and hawks, and the wonderfully realistic "Pinnated Grouse" [Greater Prairie Chicken].

TIM GALLAGHER

Above, David Corson, director of Cornell's Olin, Uris, and Kroch libraries and curator of the History of Science Collection (which includes the Hill Collection) examines a plate from John Gould's 19th century Monograph of the Trochilidae, or Family of Humming-birds. *White gloves protect the precious pages.*

At right, you'll have to see first hand the iridescent colors of Gould's Heliodoxa jacula *(Green-crowned Brilliant) to truly appreciate them.*

One of Margaret Rogers's favorites in the collection is Mark Catesby's *Natural History of Carolina, Florida and the Bahamas Islands.* It's bound in glossy green leather, with gold tooling around the edges and green moiré silk inside. Catesby spent years in the American colonies collecting birds and recording notes in the field, instead of using preserved bird specimens and secondhand reports of the flora and fauna as did earlier artists in Europe. His work was first published in 1731; a fine copy of the third edition, printed in 1771, is in the collection. You'll find some surprises in it. The "Great Booby" [Northern Gannet] is shown with its body submerged and its head protruding from the water, surrounded by plants. The Canada Goose illustration shows only the bird's head—the artist's attempt to make it look larger than a small bird of another species on the same-sized plate. Catesby also shows the plants you'd probably find associated with the birds he illustrated. His work foreshadowed that of Audubon.

The matched set of the works of British ornithologist John Gould represents the most beautiful hand-colored bird illustrations of the 19th century, work that has not been surpassed. The five folio volumes of Gould's *Monograph of the Trochilidae, or Family of Humming-birds* were published from 1861 to 1867. Gould hired some of the best artists of his day to follow his designs and sketches. His wife Elizabeth transferred the sketches onto stone for the lithographic process; the plates were then hand-colored. Gould eventually published more than 3,000 hand-colored lithographs of birds, depicting species from around the world. You can sense the movement, and you'll marvel at the design—the curves of leaves follow the birds' curved bills. The plants, often orchids, are carefully detailed and identified. Look for *Heliodoxa jacula* [the Green-crowned Brilliant], a hummingbird whose gold-green iridescent throat contrasts with its almost black back.

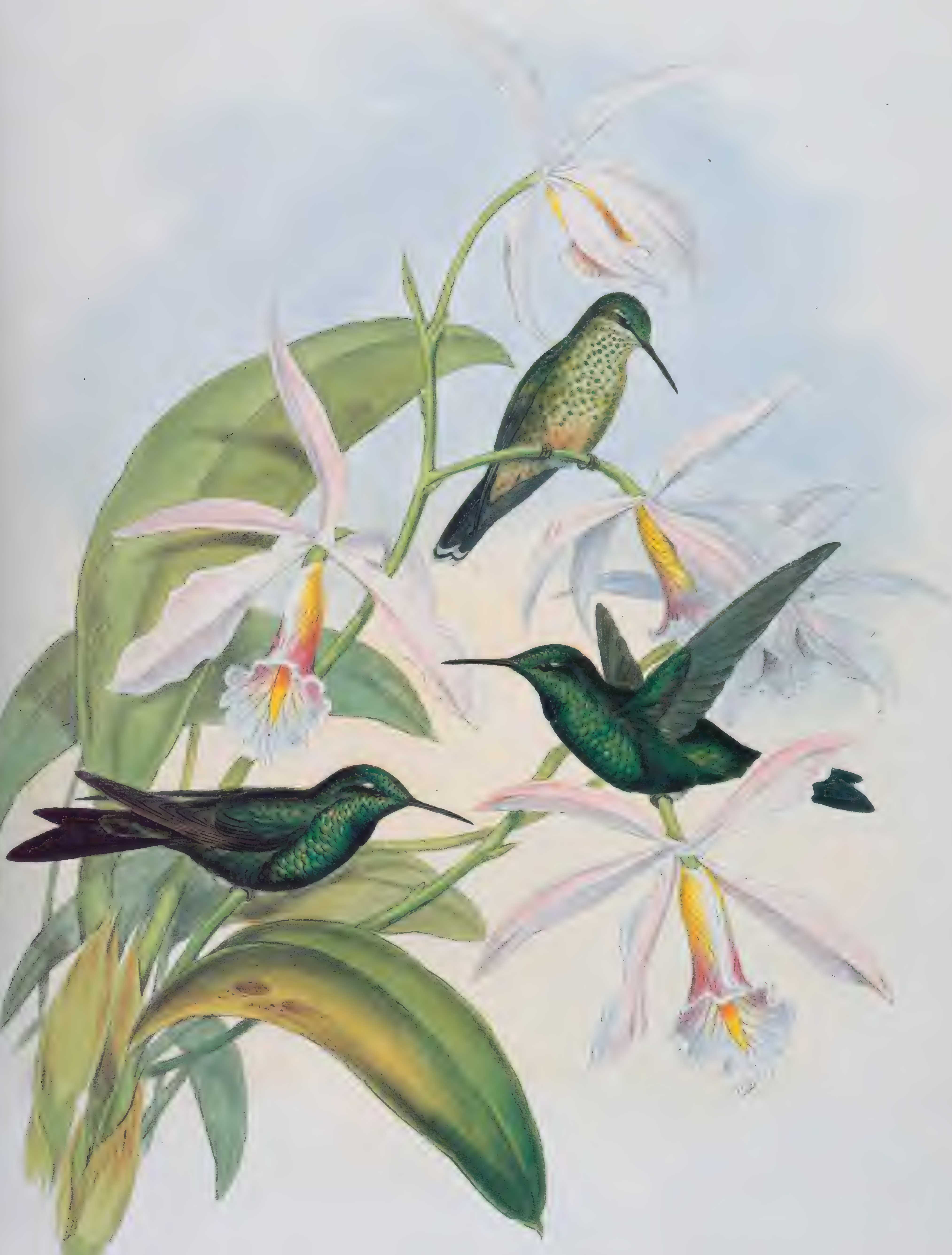
Reluctantly, I close the last book and place it back on the cart to be returned to the vault. Next time I visit I may find new treasures. The prerequisite for adding new books, Margaret tells me, is that they be useful to readers and researchers. Away from campus, if you have access to a computer and a modem, you can call up a list of Cornell's ornithology books and papers in the library's on-line catalog in the Research Libraries Information Network (RLIN). And if you need extra funding for your studies, grants are available. Above all, the librarians want people to know about the collection, and to use it.

So if you're interested in extending your birding experience to the printed page, plan to visit the birds at the Kroch Library. You'll be welcomed at this unique resource. ■

All illustrations appear courtesy of the Division of Rare and Manuscript Collections, Carl A. Kroch Library, Cornell University. The Kroch Library's History of Science Collections are open Monday through Friday from 9:00 A.M. to 5:00 P.M. year round and Saturday from 1:00 P.M. to 5:00 P.M. during the academic year.

For information on RLIN call (800) 537-7546.

Jane E. Hardy has been a bird watcher since 1950 when, as a Cornell University freshman, she took an ornithology course with the Lab's founder, Arthur A. Allen. She is a senior lecturer in Cornell's Department of Communications and enjoys watercolor painting.



Changing Course

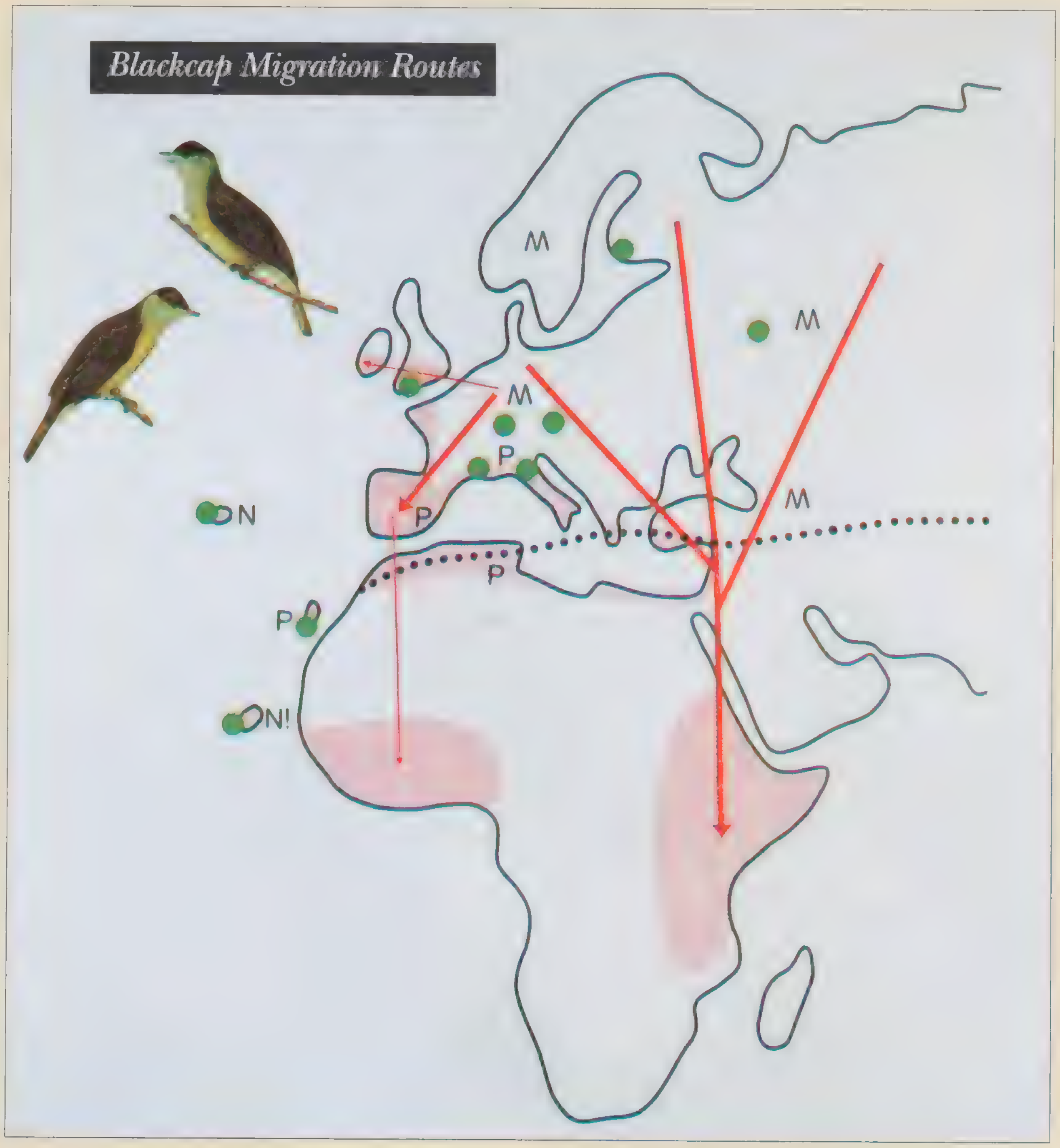
by Peter Berthold and Andreas Helbig

How long does it take a population of birds to alter their age-old migration behavior? Centuries? Millennia? In the Blackcaps' case, less than 30 years.

On December 14, 1961, some residents of the small town of Greystones, Ireland, found their cat dragging a bird, still alive, through their garden. It was a Blackcap, one of the 50 or so species of Old World warblers. But this was no ordinary Blackcap. The bird carried a band showing it had spent the summer on its breeding grounds in Austria. Instead of migrating south to the traditional Blackcap wintering grounds in Spain and Africa, however, this bird had flown northwest, to winter in the British Isles.

In the decades that followed, ornithologists found more and more Blackcaps wintering in the British Isles. Today, perhaps 10,000 individuals follow the new northwest route. In just 30 years, segments of some European Blackcap populations seem to have completely altered their migratory patterns. Moreover, the birds are continuing to extend their wintering areas northward as far as Scandinavia.

ILLUSTRATION BY STEVE CARVER



This map shows the locations of Blackcap populations and their migration routes. Some populations are exclusively migratory (M), some are partially migratory (P), and some are nonmigratory (N).

The birds breed in Europe and Africa (green dots); the dotted line marks the southern border of the continental breeding grounds.

The thick lines trace the main Blackcap migration routes—to winter quarters in Africa and the Mediterranean. The thin lines indicate two other migration routes, including the route some birds now take to wintering areas in Great Britain.

What triggered this novel migratory behavior—and how is it controlled? To answer these intriguing questions we must start with some basic information about bird migration.

As recently as the beginning of this century, ornithologists thought migratory behavior had evolved fairly recently, during the Ice Age. They theorized that birds were gradually driven south by the advancing ice; as the ice retreated, some birds moved north to fill up newly available habitat but, during the cold winters, would return south.

Today ornithologists generally agree that migration is an ancient behavior, possibly as old as birds themselves. Even *Hesperornis*, the toothed, flightless bird of the Cretaceous period, probably migrated by swimming. Furthermore, ornithologists believe that migratory behavior has evolved independently in different groups of birds. As a result, birds can be classified in three main groups on the basis of their migration patterns: migrants, partial migrants (populations in which some birds migrate and others winter within the breeding area), and residents (birds that don't migrate). Migratory behavior is most common in birds that live at higher latitudes.

If you asked an evolutionary biologist how fast avian migratory behavior can change as a result of evolution, a few decades ago the cautious answer might have been, "On the order of 1,000 years." More recently, the answer might have been, "About 100 years."

Our recent studies of Blackcaps give a strikingly different answer. Cross-breeding and selection experiments have demonstrated that many aspects of migratory behavior are encoded in the genes and can change very rapidly. Some of the behaviors that seem to be, to a high degree, genetically controlled include the urge to migrate, the onset of migration, the amount of migratory activity, seasonal patterns of migratory activity, orientation during migration, and the relative amounts of "migratoriness" and "sedentariness" in a partially migratory population. Thus these behaviors can change—evolve—in response to selective pressure.

One of our selective breeding experiments used birds from a partially migratory population (i.e., some birds in the population migrated; others didn't). We selected some migratory birds and paired them with other migrants. After only three generations, their offspring were almost exclusively migratory—even though both behaviors were present in the population as a whole.

The same was true for nonmigrants mated to nonmigrants—after only six generations, their offspring were almost exclusively nonmigratory. These results suggest that a population of birds can react to changing environmental conditions by rapidly altering the proportions of migrants and nonmigrants in the population. Migratory behavior can evolve with lightning speed—compared to geological epochs.

We reasoned that the Central European Blackcaps' novel migratory behavior—wintering in the British Isles—could have developed rapidly as a result of very small evolutionary steps (a process called microevolution). Testing this fascinating possibility would be a true challenge for us.

The first step was to obtain experimental birds. We wanted to bring Blackcaps that were wintering on the British Isles to our research facility at the Max Planck Institute in southern Germany. The British government rigidly restricts the taking of experimental animals from wild populations, but once we explained that we would just be moving "our" continental birds back to their Central European breeding area a bit earlier than usual (and more safely than the birds' own migratory efforts would allow)—and thanks to the support of the British Trust for Ornithology and some of its amateur bird banders—we were successful. During the winters of 1988 through 1990 we transferred a total of 40 Blackcaps to the institute and conducted our experiments.

In late winter, we released pairs of Blackcaps into our outdoor aviaries and allowed them to reproduce. (They produced 41 offspring over two breeding seasons.) The young birds matured over the summer; then, in the fall, we tested the adult birds and their offspring to see in what direction they would prefer to migrate.

We measured migratory direction in orientation cages—aluminum funnels lined with typewriter correction paper. The top of each funnel is covered with clear glass, so the birds can see the stars by which they navigate. When the birds try to fly away, they scratch the paper. We take compass headings from the scratches to determine the direction of migration.

Blackcaps migrating from Central Europe to their winter quarters in the Mediterranean and Africa usually follow compass headings that fall in a wide angle around 140 degrees. If you extend this angle to the west by just 30 degrees, the flight path includes southern England. We reasoned that such a small deviation from the normal heading probably lies well within the normal variation in the birds' preprogrammed, genetic instructions for migration. If this logic were correct, then we would expect to find occasional records of Blackcaps wintering in the British Isles, not just in the last 30 years, but even earlier. In fact, old reports from British birders do include occasional winter Blackcap sightings.

What direction did our experimental birds take? The adult Blackcaps caught in winter in Britain oriented themselves in a west-northwesterly migratory direction, toward

PETER BERTHOLD (3)

The authors transported Blackcaps wintering in Great Britain back to Germany for selective breeding experiments. Above, a female Blackcap incubates her clutch in the aviary; at left, a young bird begs for a bite.

The experiments showed that in the fall, when it's time to migrate, captive females orient themselves toward Great Britain. So do their offspring—demonstrating that this migratory behavior is inherited, not learned.

Britain. We knew this orientation didn't necessarily have a genetic basis—the birds could be just heading toward wintering grounds they knew from previous visits. But, excitingly, these birds' offspring also tried to migrate in a west-northwesterly direction. Our control group of German-caught birds migrated in the old, traditional direction, to the southwest.

The most conservative conclusion we can draw from these results is that migratory direction is inherited and genetically controlled, and that widespread use of this migration route must have evolved within the past 30 years. Natural selection must have acted in favor of birds that were wintering some 1,500 kilometers farther north than "normal" members of the population. This is an extremely rapid evolutionary change in animal behavior—and the first such change in a vertebrate for which a genetic basis has been established. We are convinced, however, that similar cases will be discovered soon, now that we know how rapidly microevolutionary processes can proceed.

Migration behavior can evolve with lightning speed—compared to geological epochs

Why have the numbers of Blackcaps wintering in Britain increased so rapidly in recent times? Perhaps the vagrants enjoy some advantage nowadays that the British Isles didn't previously offer. Bird feeding has become increasingly popular in Great Britain in recent decades—so with plenty of food available at feeders everywhere, the Blackcaps' chances for overwinter survival have increased, especially during the second half of the winter when natural food sources such as berries are exhausted. Another possible advantage is that Britain has enjoyed milder winters recently, perhaps due to the greenhouse effect. Furthermore, competition with other birds is probably low compared to Mediterranean areas. All of these factors add up to favorable wintering conditions that support increasing numbers of Blackcaps.

Several other factors seem to be acting in concert with improved wintering conditions in the British Isles to accelerate the selection processes. First, the distance from Central Europe to the British Isles is about one-third shorter than the distance to the Blackcaps' Mediterranean winter quarters. All else being equal, birds that travel a shorter distance reduce the costs and risks associated with travel. Above all, birds that migrate a short distance are poised for an early return to their breeding grounds.

Second, past studies have shown that photoperiod (day length) has an effect on migratory behavior—and Blackcaps in the British Isles are exposed to different light conditions than birds wintering in the Mediterranean. In Great Britain the days grow shorter much sooner in autumn, winter days are shorter, and spring day lengths increase at a much faster rate than in the south. The short autumn days should cause fall migratory activity to stop relatively early (preventing the Blackcaps from migrating beyond the British Isles); the short winter days and rapid spring increase in day length should cause an early onset of migratory behavior and reproductive readiness in late winter or spring.

Third, if the British birds are ready to migrate early in spring, and if they travel a shorter distance, they will get to the breeding grounds first. They can occupy prime territories and begin breeding long before their Mediterranean-wintering counterparts. Birds with rich territories often have larger clutches; birds that begin breeding early may have more than one clutch during the breeding season. Thus the British birds may be producing more offspring.

Finally, British Blackcaps migrating back to Central Europe find the climate generally similar to—or even milder than—their winter home. Birds returning from the Mediterranean, on the other hand, find the climate relatively harsh. The birds wintering in Britain are acclimated to cold weather and may be better able to withstand cold snaps in spring.

We have already tested some of these potential advantages experimentally. When we exposed Blackcaps to light conditions that simulated migration to Britain, they started their spring migratory activity and gonadal development earlier than birds exposed to simulated Mediterranean light conditions. We estimate that they would have arrived on the breeding grounds about two-and-a-half weeks earlier than the Mediterranean birds. If British and Mediterranean birds get to the breeding grounds at different times, then assortative mating might occur: British males breeding only with British females, and Mediterranean males with Mediterranean females. This pattern of mating would greatly enhance the spread of the new migratory pattern.

We're also checking to see whether the Blackcaps that arrive earliest on the Central European breeding grounds really are the ones coming from the British Isles. A team of amateur birders is helping us to trap the earliest arrivals, which we keep in aviaries until the following autumn, when we test their orientation behavior in funnel cages. Preliminary results suggest that these birds do show northwesterly preferences.

In a recent article in *American Birds* magazine, J. P. Myers challenged our conclusion that migratory behavior has a genetic basis, charging that we ignored the possibility that pollution caused the change in Blackcap migration behavior. Myers argued, "It is entirely plausible that contamination in parts of the German environment, passed up the food chain to Blackcap mothers and [from the mothers] to their eggs and young, is altering migration." Myers considered the impacts of such toxicants to be "at least as likely [an explanation] as rapid evolutionary change."

We disagree. We are not aware of any case in which maternally transmitted contaminants have been shown to alter orientation behavior in animals. Neither do we know of any case in which exposure to a toxin caused a novel, advantageous behavior—a behavior that allowed an animal to fill a new ecological niche—nor does Myers suggest one.

We have tested the possibility that the new migration behavior is transmitted from parent to offspring, not genetically, but through the maternal contribution to the egg. We cross-bred Blackcaps caught in Britain with those from the German population. The 54 young from that cross-breeding took a migratory direction intermediate between that of German birds and British-wintering birds, as the genetic hypothesis would predict. If migration direction were a function of some factor passed on by the mother only, each of the offspring should have oriented in the same direction as its mother.

Finally, we have no evidence that European Blackcap populations have been seriously affected by a toxic substance. They all do very well and are either stable or increasing, including the German population.

The British Isles host not only a wintering population of Blackcaps, but also a separate, breeding population that winters in the Mediterranean. We are sometimes asked why Blackcaps breeding in the British Isles keep on migrating to the Mediterranean when the conditions in their breeding area are now so good that Blackcaps from the continent winter there in increasing numbers. Why don't Blackcaps just stay in Great Britain all year round?

Our experiments have shown that, in a partially migratory Blackcap population, the relative amounts of "migratoriness" and "sedentariness" can change fairly rapidly. In an exclusively migratory population such as the British breeding population, however, a behavioral change that causes migration to cease altogether would probably be slow to evolve. British Blackcaps may become resident in the future: other species such as European Robins and European Blackbirds are resident in the British Isles and more or less migratory on the continent. But we don't expect to detect the first microevolutionary steps of such a development in the near future.

In sum, the microevolution of migratory behavior seems to happen much faster than scientists previously believed. This finding may bring hope for the future: in the face of massive ecosystem changes such as global warming, some species may indeed be able to cope with the new conditions. ■

PETER BERTHOLD

A male Blackcap, above, sings out to stake a territory. In spring, males flying from Great Britain may arrive on the breeding grounds in Central Europe weeks before males traveling from traditional wintering spots along the Mediterranean. Early birds can grab prime territories, start breeding sooner, and perhaps raise more young than later arrivals.

Peter Berthold is the head of the Vogelwarte Radolfzell, the bird research station of the Max Planck Society in southern Germany. His special interests are bird migration and evolutionary biology.

Andreas Helbig is the head of the Vogelwarte Hiddensee in northeastern Germany. His research focuses on bird orientation and population differentiation.

Further reading

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The Unappreciated Pigeon

by Alexander F. Skutch

Photographs by Tim Gallagher

While waiting for the bus to take me home from the small town of San Isidro de El General in southern Costa Rica, I often pass the time watching feral pigeons. Undeterred by the noisy traffic and bustling people, the birds drink from rain puddles in the pavement, then fly up to surrounding buildings where they roost and nest. Seeing them, I'm reminded of the pigeon's lengthy association with people. Over the long millennia of human history, pigeons have been familiar to more people than any other family of birds.

The nearly 300 species in this ancient family, *Columbidae*, have spread over all the Earth's continents except Antarctica, and they colonized many remote islands so long ago that many have evolved into endemic species. In more recent times, humans helped speed up the distribution of pigeons by domesticating one species, the Rock Dove, and carrying it with them to all parts of the planet. They also transplanted several other pigeon species to various lands where they thrive, mostly in association with people. Though some members of the family are called pigeons (a name of French origin) while others, mainly the smaller kinds, are known as doves (an Anglo-Saxon word), there is no scientific foundation for this distinction. Pigeons and doves are very similar in structure and habits.

The pigeons I watched at the bus station are descendants of the wild Rock Dove, which ranges from central Asia, India, the Middle East, North Africa, and Southern Europe to Ireland, Scotland, and islands as far north as the Faeroes. It roosts and nests on sheltered ledges or crannies in cliffs and caves, and occasionally in cavities in trees, often in semi-darkness. After humans in the Mediterranean countries began to build massive temples and dwellings of masonry or wood, Rock Doves took up residence on the various nooks

A brief history of the much-maligned Rock Dove

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and ledges of these structure. This habit facilitated their eventual domestication some 6,000 years ago in the Middle East.

As Europeans spread to the Americas, Australia, New Zealand, and other lands where this particular species was not present, they carried domestic pigeons with them to use as message carriers and food. Some of the birds strayed, managing to survive and reproduce without human care, eventually forming feral populations.

The pigeons in San Isidro prefer an urban life. In the many years I've been here, I have never seen a feral pigeon on or near our farm and nature preserve, which is only five or six air miles from the city, though seven species of native pigeons and doves have nested here. This seems to be the way of feral pigeons nearly everywhere; instead of spreading out over the countryside, they remain concentrated in cities, with a few on farms where they can find spilled grain for food and buildings for roosting and nesting. Although flocks of urban pigeons forage in nearby fields, they return to the sheltering town as night approaches.

In the city, pigeons seek natural foods on whatever grass plots or exposed earth they can find, and frequent the parks where people feed them, mainly with bread, the most readily available food for these granivorous birds. Amid crowds, they recognize and approach people who have been kind to them, even when these individuals are not offering them any food. Such recognition is gratifying to the donors, especially city people who may have no other contacts with birds or other animals. Although many people complain about the unsanitary habits of pigeons, if banished from the cities, the birds would be missed by their friends.

Feral pigeons are neglected by serious bird watchers—but watching pigeons can be a rewarding activity for young and old

Feral pigeons, regarded by many as feathered pariahs, are usually neglected by serious bird watchers. The birds have been studied most intensively by people hired to find ways to reduce troublesome urban pigeon populations. To learn how they nest and rear families, we must turn to studies of wild Rock Doves or domestic pigeons, or even to pigeons and doves of different species and genera. We can do this with confidence because the breeding habits of practically all members of the pigeon family are basically similar.

Pigeons are monogamous. Mates are strongly attached, resting close together, caressing and preening one another, with the male often regurgitating food for his consort. He guards her closely, driving away other males that approach her. After the pair has chosen a site for their nest, they build it together, exhibiting a division of labor widespread in this family. The female sits on the growing structure while her partner gathers nest material. Depending on the species, the male may break twigs from high in trees or gather straws and weed stems from the ground. If a piece breaks when he shakes it, he drops it and seeks another. With a contribution in his bill, he flies to the nest and stands beside the female, or on her back, while he lays the piece at her side. She arranges it, turning from side to side to distribute the pieces all around, while he goes off for more.

Unlike many passerine birds that collect a billful to take to the nest, the pigeon brings only one item at a time. Feral pigeons, reduced to gathering whatever they can find in the hearts of cities, may lack the wide choice of materials available in natural habitats. Their poorly attached nests may slip from flat or sloping ledges, or be blown away by a strong breeze.

Domestic and feral pigeons lay two white eggs, as do a majority of pigeon species. Though white eggs in shallow nests would appear to be readily noticed by predators, pigeons compensate for their eggs' lack of cryptic coloration by sitting on them nearly continuously after the first is laid. Unlike many songbirds, male and female pigeons share incubation, the male sitting through much of the daytime, the female at night, with only two changeovers in 24 hours.

As a boy, I kept common domestic pigeons, white Maltese and maroon Carneaux, and I learned that their eggs hatched in about two weeks. The incubation period of the wild Rock Dove on the Faeroe Islands and of some of its closest relatives is 16 to 18 days. A newly hatched pigeon is a soft, helpless creature, with pink or whitish skin, sparsely covered with tufts of short, hairlike, straw-colored or whitish down. Its eyes are tightly closed. The short, dusky bill becomes blacker toward the end, then abruptly whitish at the tip. A hard, whitish egg tooth at the tip of the upper mandible, and a similar but smaller one at the end of the lower mandible, help the chick to break out of its shell. The parents carry away the empty shells, usually half at a time, unless the two parts hang together.

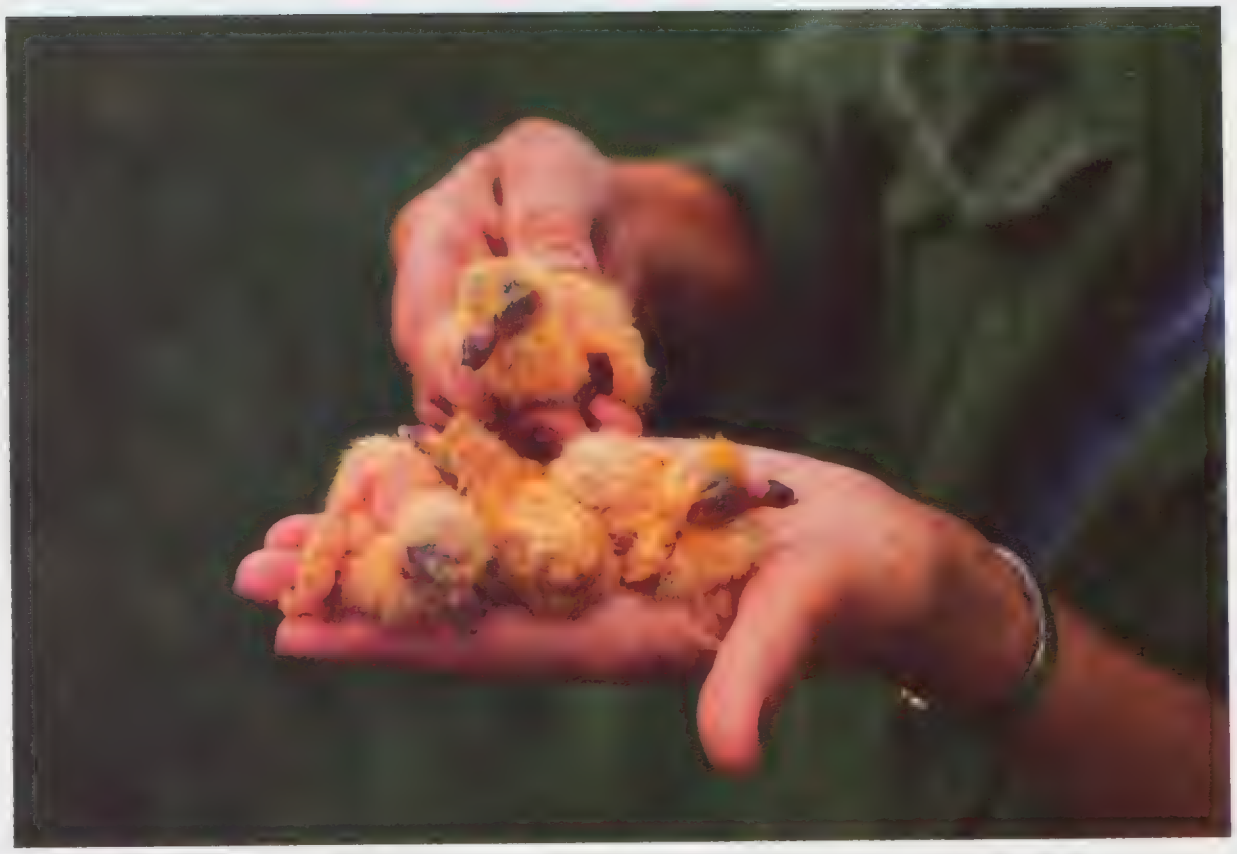
As hatching time approaches, both parents undergo physical changes that enable them to feed their progeny. The walls of the crop, a saclike expansion of the esophagus, thicken until its weight is increased threefold. Special cells lining the crop swell with proteins and globules of fat, then slough off, producing crop milk. Composed of 13 to 19 percent protein, 7 to 13 percent fat, 1 or 2 percent mineral matter, vitamins A, B, and B_2, and 65 to 81 percent water, pigeon milk is highly nutritious, but lacks the sugar and other carbohydrates found in mammalian milk. During the nestlings' first few days, pigeon milk forms in the parents' crops only when they are empty, thereby ensuring that it doesn't mix with more solid food that might be impossible for the hatchlings to digest. As the young birds grow older, they receive more and more of the food swallowed by the parents mixed with the milk. Domestic pigeons provide milk for their young until they are about 16 days old.

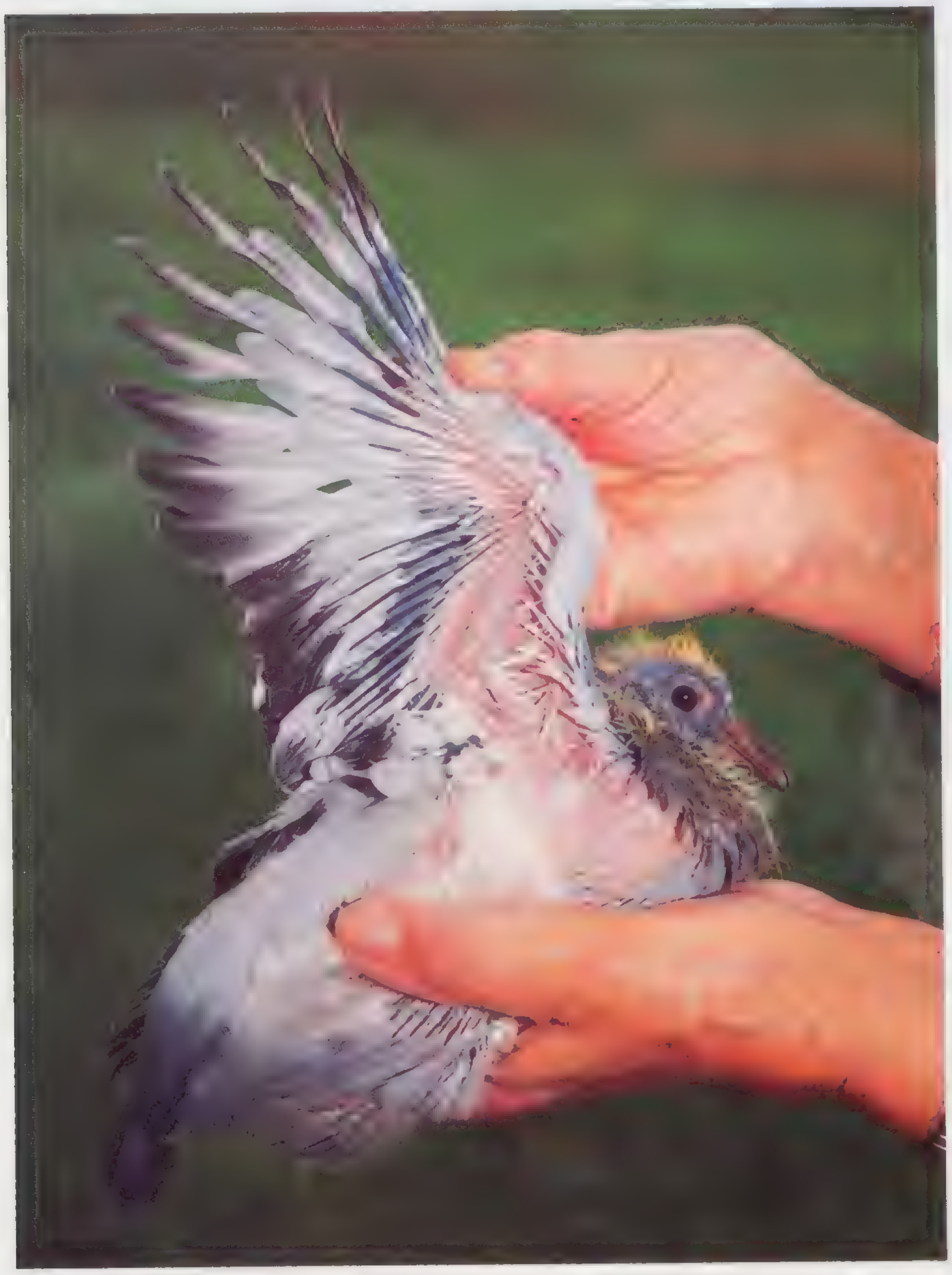
When a parent pigeon comes to feed its brood, it has nothing visible in its bill or mouth. Until the nestlings' eyes open, they are often fed singly. After they can see, the members of a brood of two insert their bills in opposite corners of their father's or mother's mouth, and three heads bob up and down together as the parent pumps up food from its crop with strong muscular movements. Meals become more widely spaced and briefer but more copious as the nestlings grow older.

Some pigeon species neglect to clean their nests. The young birds' accumulated droppings cement the flimsy structure together and may prevent its being blown away by wind. Other pigeons, including Ruddy Quail-Doves and White-tipped Doves, keep their nests as clean as those of passerine birds. I have watched parents swallow droppings before delivering food, making me wonder how, or if, they avoid returning the nestlings' excrement to them.

If a person suddenly appears close to a pigeon's nest, the surprised parent often darts away with wildly flapping wings, knocking one or both of its eggs from the shallow bowl and giving the impression that it is a flighty, careless bird. Watching nests from blinds has increased my respect for pigeons' intelligence. Alert to sounds, they watch approaching humans or other animals and weigh the chance of being detected by a potential enemy before they decide whether to stay or flee. A Band-tailed Pigeon remained covering its egg while, on three occasions, a man seeking firewood or stray cattle passed beneath it. The noisy approach of horses or cows did not scare this or other pigeons from low nests. Often they valiantly defend their eggs or young. One evening at twilight, low thuds drew my attention to a White-tipped Dove protecting its nest in a tangle of climbing ferns by striking a snake with blows of a wing, which pigeons use instead of fists.

If such defensive measures fail, or often in their absence, a threatened parent may drop to the ground and flutter along as though crippled, to lure a hungry predator away. These distraction displays, far from being the frantic, convulsive behavior of a





Above, these recently hatched pigeons are covered with hairlike down. Both parents feed their young on "pigeon milk," a fatty, whitish liquid secreted in the crop. At left, an older nestling has sprouted some flight feathers. Rock Doves may stay in the nest for 20 to 30 days before fledging.

City pigeons come to recognize people who feed them, above. The grain-eating birds forage for whatever natural foods they can find in city parks, plus bread and other snacks offered or discarded by humans.

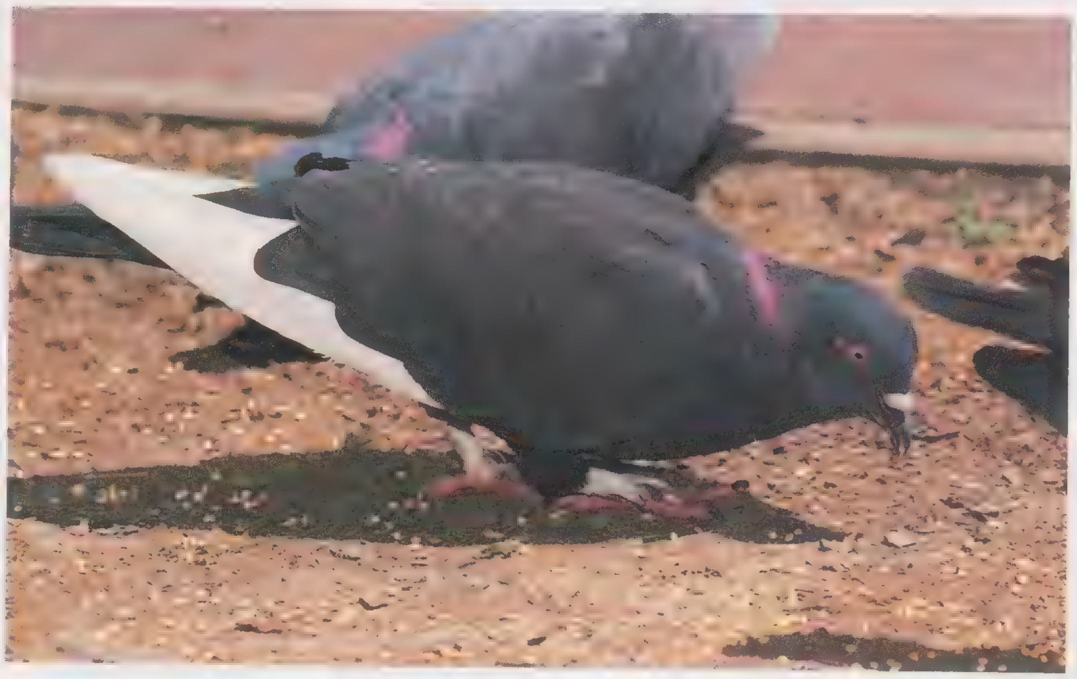
These feral pigeons flaunt a variety of colors, including "pied," at right, and "blue-checkered" and "mealy," above right on facing page. In a city flock, birds of certain colors may tend to feed first; also, females may select a mate based on his flashy feathers.

parent torn between attachment to its young and self-preservation as earlier ornithologists too hastily concluded, are deliberate, often successful, attempts to save both its progeny and itself, both of which would be lost if the parent stuck stubbornly to its nest in the face of a predator. Widespread among birds with low nests, distraction displays require controlled movements and cool calculation to remain near enough to the enemy to encourage its pursuit, without permitting it to approach dangerously close. In the absence of a parent, older nestlings of domestic pigeons and related species try to defend themselves, rearing up, clacking their mandibles together, and lunging forward, sometimes striking an intruding hand.

Most young of small and medium-sized pigeons remain in their nests for 12 to 14 days. Rock Doves, however, stay 20 to 30 days, or occasionally more in a safe nest in a cave. For a number of nights after they leave the nests, siblings of several pigeon species have been found roosting in contact with each other, often with one or both parents close to them.

Feral pigeons are extremely diverse in coloration. The ones I was watching while waiting for the bus in San Isidro were so varied that no two looked alike. Derek Goodwin, author of *Pigeons and Doves of the World,* recognized eight main types of feral pigeons: blue (most like the ancestral Rock Dove), blue chequer, velvet, mealy, red chequer and red, grizzled, black, and pied. To this list we might add white. When you add to this all the breeds of domestic pigeons that have not become feral, it is evident that their variation under domestication has been enormous. Charles Darwin, who raised domestic pigeons as part of his preparation for writing *On the Origin of Species,* estimated the number of distinguishable kinds as over 150, some of which differed only slightly from others. Among the more strongly differentiated forms are pouters, able to inflate their chests enormously; carriers, best for homing; runts, facetiously named because they are so big; fantails, with two or three times the normal number of 12 tail feathers; tumblers, fantastic birds that turn somersaults in long sequences, on the ground or in the air; frill-backs, with upwardly curled feathers; nuns, small, elegant pigeons with white bodies and contrastingly colored heads; and many more. People of his time commonly believed that these different pigeon breeds must be derived from eight to a dozen wild species. But Darwin was convinced that all of them descended from Rock Doves. His studies of pigeons helped to support his theory of evolution.

What a contrast between the pigeons I see in town and the wild White-tipped Doves that we feed every morning on our lawn. Unlike the feral pigeons, which vary widely in appearance, these doves look very much alike throughout their vast range, from southern Texas to central Argentina. Yet, as in all organisms, they must occasionally be subject to mutations that alter their appearance and other characteristics, behavioral and structural. In the case of domestic pigeons, mutants



have been selected by human breeders, who over the generations have produced the weird forms that they cherish. But what keeps White-tipped Doves and other wild birds so uniform? Among the possibilities are natural selection and sexual selection, or mate-choice.

Because it occurs in nature, sexual selection is generally considered to be a mode of natural selection, but it actually operates quite differently. Natural selection eliminates individuals whose capacity for self-preservation or reproduction falls below the norm of their species. A color variation that does not make an individual more conspicuous to predators might not be eliminated by natural selection. Sexual selection provides increased opportunities for reproduction with preferred individuals. If White-tipped Doves always chose mates that resemble their parents, it would keep their appearance uniform.

Nancy Burley conducted experiments in Texas with large numbers of feral pigeons that were released in an aviary and given the choice between differently colored potential mates. The males in her study often seemed more interested in the nest boxes available to them than in the colors of the females they attracted to their nests. Females were more selective, and the more experienced they were, the more attention they gave to the quality of their partners. In descending order, they preferred blue checker males over blue bars over ash reds. Both sexes could somehow assess the experience in breeding of their companions and selected super-experienced over semi-experienced over inexperienced individuals of the opposite sex. Males seven years of age or older, however, were less likely to be chosen as mates; their ability to rear families wanes with greater age. The varied plumage of feral pigeons everywhere is proof that selection of mates does not keep them uniform in appearance.

With soft voices, gentle ways, and exemplary family life, pigeons so endeared themselves to humans that in ancient times they became symbols of love, faithfulness, and spirituality. Feral pigeons are the birds most often seen by many urban people, who feed them and welcome the approach of those who recognize their benefactors. These interesting birds, so often neglected by people who prefer to watch wild birds, provide opportunities for absorbing studies by city-dwellers. The ease of recognizing individuals by their color patterns makes it largely unnecessary to trap and band them—a time-consuming task for students of bird behavior.

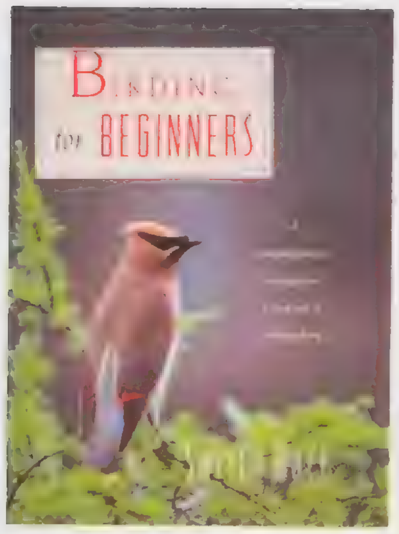
Diligent attention to feral pigeons could answer many questions about their lives. What foods do they prefer? What makes some individual pigeons dominant over others, and what advantages does high status give? Do pigeons prefer mates of certain colors or do they pair indiscriminately? Do they incubate with a schedule similar to that of wild pigeons? How long does incubation last? How long do the young stay in the nest, and for how many days after they leave do their parents feed them? Do they ever give food to nestlings other than their own? If carried a significant distance away, how do they find their way home? Some of these things may be well known for wild pigeons and those sheltered in aviaries, but it would be interesting to learn how the distractions of urban life affect the behavior of pigeons that live in cities. Watching feral pigeons, with definite questions in mind and careful note-taking, can be a richly rewarding activity for young and old. ■

Alexander F. Skutch is a world-renowned ornithologist who lives in Costa Rica. He has spent more than half a century studying and writing about birds.

Hundreds of young people across the United States are taking a new interest in the Rock Dove. Through the Cornell Lab of Ornithology's ***Project PigeonWatch*** *they are carefully observing the city pigeon, trying to answer questions about this ubiquitous bird's feeding and courtship behavior.*

Project PigeonWatch is an ideal activity for urban students, especially those in science-oriented after-school programs. For more information, write to Project PigeonWatch, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850, or call (607) 254-2440.

Critics' Corner



Birding for Beginners

by Sheila Buff

New York: Lyons & Burford, 1993.
Paper, 190 pages, $14.95.

My friend Esther wants to become a bird watcher, but she doesn't know where to start. She knows she should buy binoculars and a field guide—but which ones? She thinks she might like to go on a trip with the local bird club—but she feels intimidated by the thought that everyone else would be so much more experienced.

Luckily, Esther's birthday is coming up, because there's a new book out that's perfect for would-be birders: Sheila Buff's *Birding for Beginners.* From optics to identification, this book has everything Esther needs to get out there and wield her binoculars with confidence.

Buff begins at the very beginning—not with bird identification, as you might expect, but simply with how to see birds. Old hands know that birds are active at dawn and dusk, that bad weather during migration brings a fallout, and that summer is the slow season for bird watching—but a beginner might not.

Subsequent chapters cover such topics as navigating your way through a field guide, identification tips (including birding by ear), and interesting behaviors to watch for. Buff teaches you how to get the most out of a checklist, organize your own bird lists, shop for optics, and stay warm, dry, and comfortable in the field. Appendices list birding organizations and birding hot lines by state, and there's also information on magazines and books for your birding library.

Birding for Beginners fits in a niche that's currently not very full—as far as I can tell, Jack Connor's excellent book, *The Complete Birder,* is the only comparable title that's still in print. Connor's book is a step beyond this one, though—I'll give it to Esther for her next birthday.

Buff, the author of *The Birdfeeder's Handbook* and *The Birder's Sourcebook,* doesn't presume that you have any prior birding knowledge—but she doesn't talk down to you, either. The large-format paperback is a quick read. You could digest it at a sitting, but beginners will probably want to take it a chapter at a time.

When she's handing out advice, Buff is nothing if not frank. Writing about choosing a binocular, for example, she advises, "Skip the inevitable period of increasing dissatisfaction and frustration that comes with crummy binoculars, and go right for the good ones." Debating the merits of birding vests, she says, "They can make you look a little dorky . . . but you're a birder and don't care what people think."

This book does a particularly good job of promoting birding ethics. With each topic she introduces, Buff makes sure new birders know how to behave responsibly in the field, and she reprints the American Birding Association's Code of Ethics in one of the appendices.

I would have liked to see Buff take a stand in the chapter on binoculars. She tells you what to look for in a good binocular, and then—very fairly—leaves you to make your own decision. But hey, there are some makes and models that the birding community generally recognizes as being especially well suited to birding. Naming names would make life a lot easier for shy binocular purchasers.

I also think this book would have benefited from more and better illustrations. When Buff discusses sonograms, I want to *see* a sonogram. The antique illustrations by Alexander Wilson don't really fit the tone of the book—and they're probably not the best illustrations for the topics they accompany. Sticking the color photos in the middle of the book was surely a cost-saver, but this placement makes them seem just that—stuck in.

On the other hand, since the publisher *was* careful about costs, this book is reasonably priced, so you can give it to lots of your beginning-birder friends. And while you're at it, pass them the field trip sign-up sheet.

—Cynthia Berger

CHAUCER'S CHECKLIST
by Michael Jeneid

Chaucer's Checklist

by Michael Jeneid

Capitola, California: Pandion Press, 1993.
Paper, 130 pages, $14.92.

Was medieval poet Geoffrey Chaucer a birder? The answer, according to author Michael Jeneid, is probably yes. In his recently released book, *Chaucer's Checklist,* Jeneid presents the case that the great 14th-century poet had much more than an everyday knowledge of birds, and that this is reflected in the bird imagery sprinkled throughout Chaucer's poetry. More than 500 references to birds appear in his collective works.

Jeneid, who describes himself as a "private scholar," attempts to figure out exactly which species Chaucer is describing in some of his bird references. Some of the species are easy to identify—a "cukkow" is obviously a cuckoo; a "goshauk" is a goshawk—while others are completely baffling. What in the world is a "tydiff?" Described variously by literary critics as a titmouse or wren, the name tydiff appears twice in Chaucer, but nowhere else. Was it a poetic invention or an actual species? I won't ruin the surprise by telling you which species Jeneid came up with for the tydiff, but he does build a convincing case for his choice.

Michael Jeneid approaches his task like a sleuth, tracking obscure references through ancient texts, some dating back to Aristotle. He offers a list of 50 bird species found in Chaucer and a lengthy discussion of each species, often sprinkled with quotes from Chaucer, Shakespeare, and other notables. Jeneid's enthusiasm is contagious, which makes reading some of the more difficult passages from Chaucer more interesting.

Not everyone will like this book. Unfortunately, *Chaucer's Checklist* dangles in limbo somewhere between a scholarly and a popular work. It may well frustrate potential readers at both ends of the spectrum. Chaucerian scholars will want to see a more thorough discussion of the other authors—and there have been many—who have written about Chaucer's bird imagery, and also a better bibliography. Others will want the book to be more accessible, explaining in greater detail references that Jeneid takes for granted everyone will know.

Anyone who does not have a moderate grounding in Chaucer should read some of his major works, such as *The Canterbury Tales* and *The Parliament of Fowls* before reading *Chaucer's Checklist.* And keep your Chaucer text close at hand while going through Jeneid's book. You may find many references that you want to look up, to see them in context.

I must still applaud Jeneid's efforts and encourage him to write more books of this kind. (I understand that he plans similar works on Dante and Shakespeare.) He brings the keen eye of a birder to the study of great literature, and a refreshing sense of wonder.

— Tim Gallagher

To order Chaucer's Checklist, *send $14.92 (includes postage) to Pandion Press, P.O. Box 1635, Capitola, California 95010.*

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After reading it, I realized that what he had done was to create a compendium, or in truth, an encyclopedia, of thousands of bits of hard information about birds. There seemed to be almost no fact pertaining to birds—their lives, habits, behavior, dimensions, morphology, anatomy, etc., that was omitted.

From the introduction by Arnold Small

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STRANGERS IN THE NIGHT

by Pete Dunne

It was 10 minutes to midnight when we exited the New Jersey Turnpike and hit the old cobblestone lane leading to Kearny Marsh—home of the Pied-billed Grebe, a "must get" on a New Jersey big day.

"Great place to dump a body," one of my World Series of Birding teammates couldn't help but notice.

We wove a path around refuse, potholes, and discarded auto parts, turning onto the unmarked drive that goes past the trucking company and ends (as most lanes leading into the tidal wetlands of Hudson County do) at the base of a trash heap.

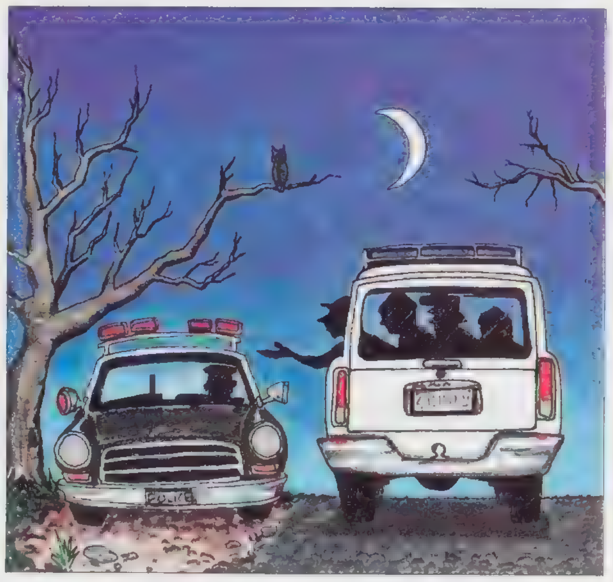
The police car, with its single uniformed occupant, was parked halfway down the lane. It was too much to hope that a Hudson County patrolman would not want to learn why four men dressed like characters out of *Lord of the Rings* would be driving a $40,000 sports sedan with Connecticut plates down a dead-end road at midnight, so we stopped as we drew abreast of him.

The patrolman's face was impassive but hardly indifferent and only a slightly raised right shoulder betrayed his unease. He didn't ask silly questions. He didn't want to see a driver's license or vehicle registration. He wanted an accounting. He said this with his silence.

"I know you're going to find this hard to accept," I offered, "but believe it or not, we're bird watching."

Once you've started joining Christmas Bird Counts, big days, and rare bird chases . . . once you've traded in your chickadee feeders for a Q-beam and gotten on a first-name basis with the night clerks at every all-night convenience store within 100 miles of home, you've stepped across the bounds of civilized social behavior. You've become a night thing, someone whom authorities regard with suspicion and everyday citizens with nervous hostility.

Not that you can really blame them. After all, you're up at hours that even Wee Willy Winky would eschew, and that's certainly suspicious. In addition, you're up at hours even Wee Willy Winky would eschew and you aren't watching Arsenio—that's even more suspicious. But what's worst, you're driving around with binoculars, and that's the most suspicious thing of all.



Back when I was director of the Cape May Bird Observatory, a local reporter once called to let me know that an unnamed informant claimed to have conclusive evidence that bird watching was an organized cover for Peeping Toms. "Would you like to make a statement?" he inquired. I said that it sounded like wishful thinking on someone's part, but to keep me posted.

On a per capita basis, there are probably no more (or fewer) social misfits among birders than brick layers—but keeping the hours of graveyard shift deejays does offer birders engaged in their night thing the opportunity to rub elbows with society's unsavory fringe. I can't begin to recall how many substance abusing drivers I've circumnavigated while driving to some pre-dawn rendezvous or how many walk-up weirdos I've had to humor at gas stations and highway rest stops. Fortunately, only once have I found myself in a situation that, upon reflection, was potentially life threatening. What saved me was the opportune arrival of another vehicle—and my wife Linda's police academy training.

We were far luckier than birder Wes Biggs, who was shot and wounded while working on Florida's Breeding Bird Atlas. Wes, out owling, was sitting in his car, making pertinent notations on an atlas form, when someone fired an assault rifle through his car window, hitting Wes in the arm. Authorities speculate that the owner of the weapon must have mistakenly concluded that Wes was making observations of interest to Treasury Department agents.

Most nocturnal encounters are merely frightening. Greg Hanisek's story is a case in point. He and two acquaintances were out at O-dark-thirty on a Sunday morning Christmas Bird Count. They were parked at the end of a desolate rural road with their backs to a collapsed bridge, when a car with its high beams on approached them. The vehicle came to a halt at the foot of the bridge, trapping Greg and his friends in a cone of light.

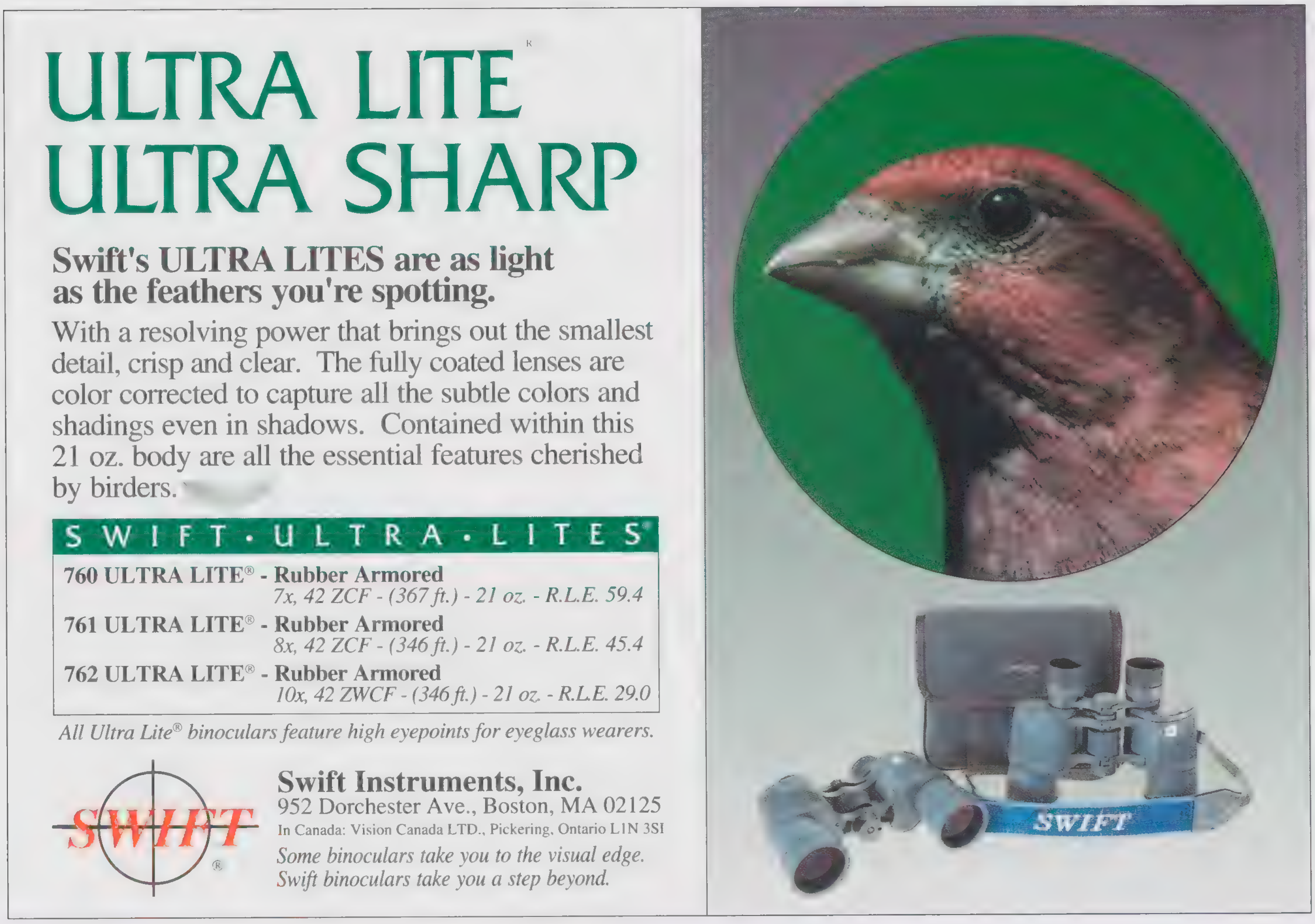
As the birders waited, each of them planning an escape route, a car door opened, and a shadowy figure walked toward them. Suddenly the man reached into his pocket, pulling out an object that he pointed directly at the agitated trio.

At this point, Greg and his friends noticed that the man's approach was anything but steady. In fact, he was weaving badly, barely able to stand. When he came close enough to disclose that the object in his hand was not the expected pistol but a billfold, the figure began imploring the surprised trio, "Pleash, jush take my m-mon-ey. . . . Doan hurt me."

The policeman didn't say anything after my disclosure. He didn't raise an eyebrow; didn't offer any clue to indicate how what I'd said had affected him. After 10 pensive seconds he offered a single, unblinking nod that was part affirmation and part admission that our excuse was one for the record books. Then he drove away.

I guess he believed us. Either that or he concluded that anyone brash enough to offer such an implausible accounting was probably capable of anything and, since he had no backup, would be better left alone. ■

ILLUSTRATION BY JEFF SIPPLE



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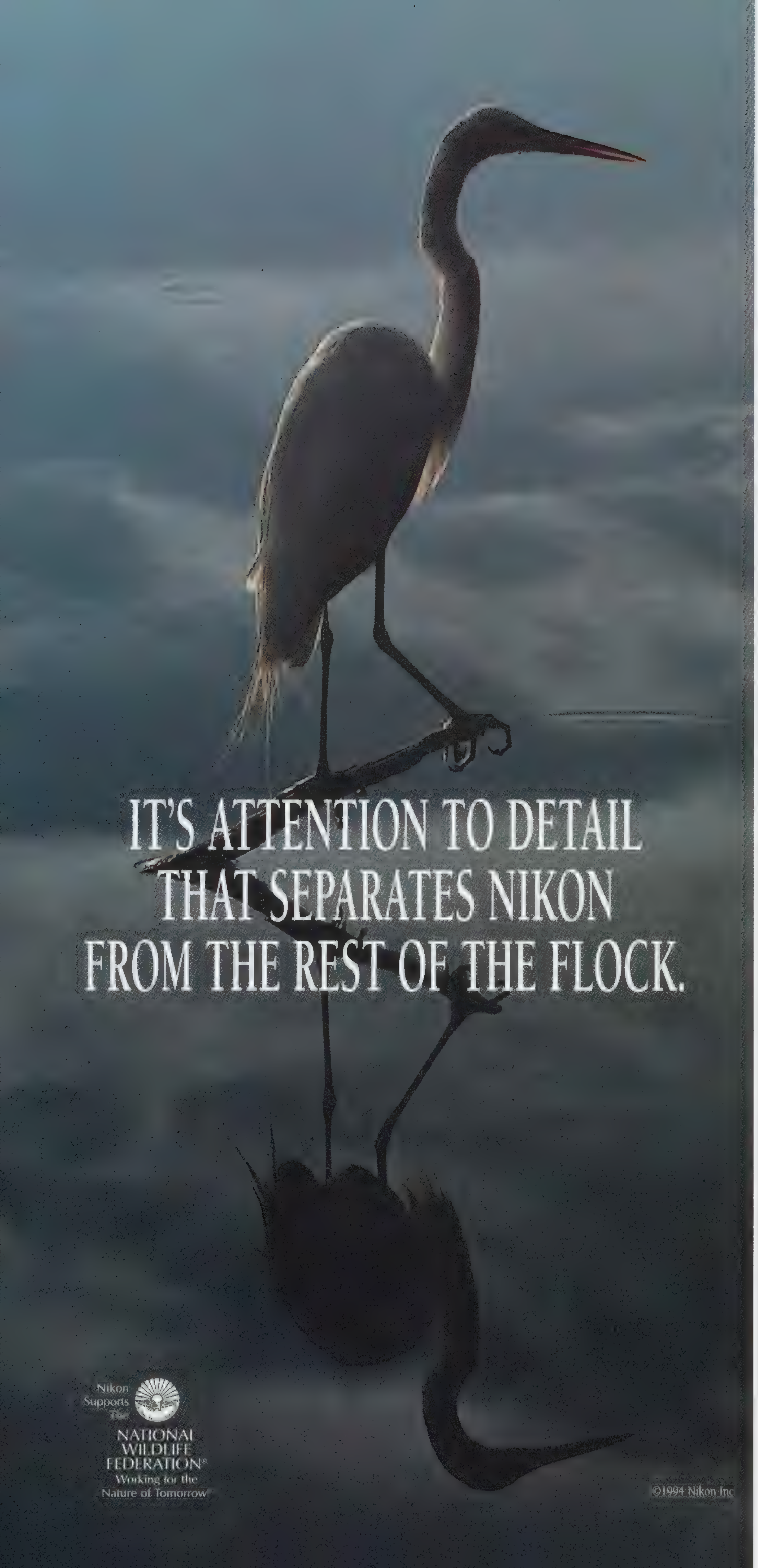
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LIVING BIRD

AUTUMN 1994 VOLUME 13 NUMBER 4

Greetings from Sapsucker Woods

The spirit of famed artist Louis Agassiz Fuertes looms large over the Lab of Ornithology. Walk down any hallway in the building and you'll likely encounter one or more of his magnificent paintings—a white Gyrfalcon perched regally on a rocky outcropping; an Argus Pheasant performing its fabulous courtship display; a Golden Eagle hotly pursuing a fleeing White-tailed Ptarmigan.

Or step into the Lab's Fuertes Room, where the Monday Night Seminars are held. This large, richly adorned room—with dark-paneled walls of Java teak, encircled above by a vivid collection of 24 Fuertes bird paintings—was originally a private study in a 66-room Tudor mansion owned by Frederick Foster Brewster. Fuertes was commissioned by Brewster more than 80 years ago to create the paintings, which depict a variety of bird species and habitats. Years later, Brewster bequeathed the room's contents to the Cornell Lab of Ornithology. The wood panels, glass-fronted bookcases, and paintings were painstakingly removed and later reassembled here in 1968.

In this issue we present a small portfolio of black-and-white gouache paintings from Fuertes's first commission as an artist nearly a century ago. Read how these priceless early works nearly ended up on the rubbish heap in "One Man's Treasure," an article by *Living Bird* managing editor Cynthia Berger that accompanies the illustrations.

We invite members and friends of the Lab to visit Ithaca and see our collection of Fuertes's art firsthand. Though Fuertes passed away decades before the Lab building was erected at Sapsucker Woods, the Fuertes Room and all the beautiful paintings that adorn the walls of the Lab form a lasting monument to a great artist who once lived and worked here in Ithaca.

Tim Gallagher
Editor-in-Chief

Cover: The subtle beauty of this Dark-eyed Junco is enhanced by the bare, red dogwood branches in the background. These fascinating birds are the most widespread backyard feeder visitors across North America, according to data from Project FeederWatch. Read how you can participate in this worthwhile program on page 34. Photograph by Marie Read.

Right: This stunning portrait of an Andean Cock-of-the-Rock pair is just one of hundreds of color illustrations that artist Guy Tudor is completing for a new series on South American birdlife. Story on page 20.

Back Cover: An Ostrich's eye view? Photographer Rita Summers speculates that this Ostrich was searching for insects on its stomach when she took this bizarre picture. Story on page 14.

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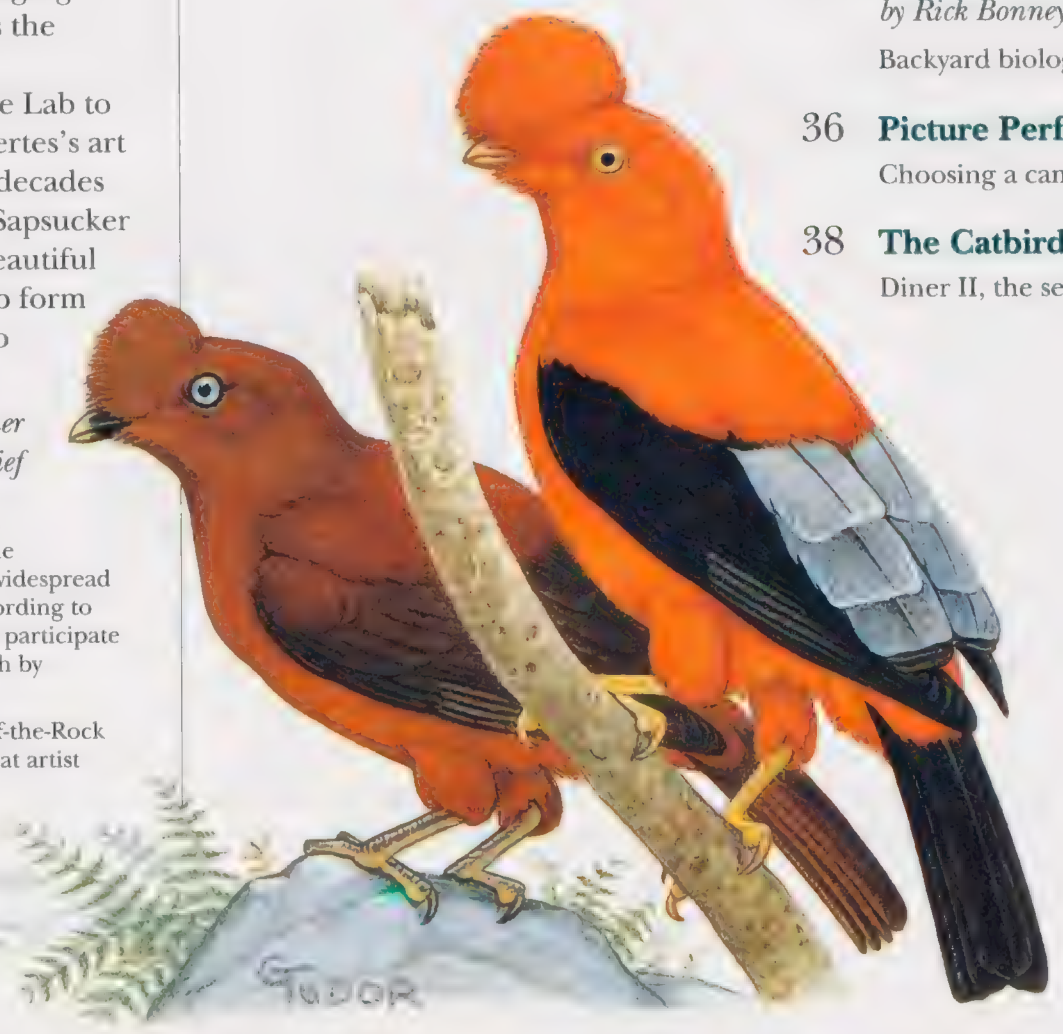

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AUTUMN 1994 VOLUME 13 NUMBER 4

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Living Bird, ISSN 1059-521-X, is published in December, March, June, and September by the Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850. Telephone: (607) 254-BIRD. *Living Bird* is free to members of the Laboratory, a nonprofit, membership organization dedicated to the study, appreciation, and conservation of birds. For more information please write to our Membership Department. Membership is $30 a year. The Laboratory assumes no responsibility for unsolicited photographs or manuscripts. © 1994 Cornell Laboratory of Ornithology.

Printing by Cayuga Press, Ithaca, New York.

Color separations by Brodock Press, Utica, New York.

Printed on recycled paper.

Letters

TIM GALLAGHER

CONFESSIONS OF A PIGEON WATCHER

I was very impressed with the Summer 1994 issue of *Living Bird.* I especially enjoyed Alexander Skutch's fascinating piece, "The Unappreciated Pigeon." As a child I raised and trained homing pigeons, and since then I've always had a special place in my heart for these common birds—even the feral variety that so many city dwellers despise.

Since I became a birder a decade or so ago I learned to hide my appreciation of pigeons and snicker along with the birding crowd when "Rock Dove" sightings were announced. Now, thanks to your article, I feel I can come out of the closet and say, "Yes, I like pigeons."

Robert Bartlett
Fallbrook, California

BIG DAY WOMEN

In her letter in the Spring 1994 issue of *Living Bird,* Ellen Short says, "What was probably the first all-women's team" participated in the 1992 World Series of Birding.

Actually, the first all-women's team entered the Biggest Day contest in 1988, when four Gulf Coastians ventured northward into terra incognita to test their skills.

Wearing T-shirts designating themselves the "Mississippi Mudders," the women often were asked if they were the mothers of the Mississippi team, to which they would reply, I hope with appropriate hauteur, "No, we *are* the team."

Organized and led by Judith Toups of Gulfport, the four placed third in the "Out-of-Region" competition and fifteenth overall. A charming account of their experience appeared in the October 1988 issue of *Birder's World.*

Raymond A. Russell
Kiln, Mississippi

AW, SHUCKS

I find *Living Bird* a most delightful and informative magazine and especially enjoy the color pictures, truly worthy of framing. Congratulations on such an outstanding magazine.

Theresa Wicklin
Maitland, Florida

SUCH BAD TASTE

How easily we forget that not all who enjoy birds do so with binoculars. Stanley Temple's delightful article, "Foul Fowl," (Spring 1994) reminds us that the best birders use all their senses.

The recent trial of a hunter accused of killing and eating a Bald Eagle demonstrates the value of taste. Aquitted after explaining that he was lost and starving, he was asked by the judge how the eagle tasted. "Well," he replied, "not too bad really. Somewhat between a Peregrine Falcon and a Whooping Crane."

Here in the Great Basin, I've marvelled that Black-billed Magpies can meander noisily in flashy black-and-white and still avoid being exterminated by Prairie Falcons and Sharp-shinned Hawks. Could it be that magpies taste bad, too? Not brave enough to sample one myself, I'll anxiously await the upcoming publication, Peterson's *Palate Guide to Western Birds.* In the meantime, I'll try to bird with all senses alert. Is anyone working on a birders' scratch and sniff?

Kevin J. Colver
Elk Ridge, Utah

We welcome letters from readers. Address letters to: The Editors, *Living Bird,* 159 Sapsucker Woods Road, Ithaca, New York 14850.

BirdNews

Crested Tit by V. Hasselblad (VIREO)

Fledging in Forest Fragments

Here in North America, conservationists tend to trumpet the plight of forest-breeding, migratory songbirds: When expanses of forest get carved up by development, migrants sometimes don't have much luck rearing young.

But forest fragmentation isn't a problem just for migrants—it also affects the birds that live in forests year-round. According to University of Belgium researchers Luc Lens and André Dhondt (now director of the Lab's Bird Population Studies program), young Crested Tits fledge just fine in fragmented forests, but may have trouble claiming a high-quality winter home. (*Ibis* vol. 136: 147-152; 1994).

The researchers compared tits nesting in a large, pine forest to other tits nesting in forest fragments. They found that birds in fragments waited longer than birds in continuous forests before starting a second clutch. Nestlings reared in fragments also weighed less than those in continuous forests, perhaps because parents couldn't find enough insect food for their offspring.

Despite the weight difference, birds in both habitats fledged in about the same amount of time. But after fledging, a difference emerged in the timing of dispersal. Young Crested Tits leave their parents' territory at the end of the summer, traveling two kilometers or more to join a winter flock. Birds reared in intact forests left home about a week earlier than birds reared in fragments. The early birds joined winter flocks in continuous forests, which are high-quality habitat; birds reared in fragments were more likely to end up wintering in low-quality fragments. According to Lens and Dhondt, the better a bird's winter territory, the better its chances of surviving the winter.

Vocal Variety

Some species of birds drone a single, monotonous song; other species have the repertoire of an operatic diva. Among these star performers, the males of some species—but not all—enrich their repertoires by imitating the individualized songs of their conspecific neighbors. Why the vocal variety? Recent research by Nature Conservancy biologist David Ewert and Lab administrative board member Donald Kroodsma provides some insight *(Condor* vol. 96: 190-196; 1994).

The two examined recordings of Rufous-sided Towhees to see how many different songs each individual sang. Wait a minute—how can a study of a single species answer a question about differences between species? It works like this: Ewert and Kroodsma compared towhees from different parts of the United States (New York versus Florida). They reasoned that this experimental design would show what ecological situations led to differences in vocal behaviors.

As it turned out, the Florida birds averaged eight different songs; New York birds averaged only about half as many. Florida towhees also imitated their neighbors' songs much more often than the northern birds.

Why the difference between the two towhee populations? The New York birds migrate; the Florida birds are year-round residents. Birds in the Sunshine State may adopt their neighbors' songs simply because, over a lifetime, they spend more time hearing the same songs. Over time, the resident towhees may even have evolved a superior ability to imitate their neighbors and learn larger repertoires.

California Gnatcatcher by Herbert Clarke

Gnatcatcher Relisted

Conservationists interested in the status of the California Gnatcatcher are swiveling their heads faster than spectators at a pro tennis match as the tiny gray bird bounces on and off—and on—the endangered species list.

Its numbers reduced to about 2,000 breeding pairs, the gnatcatcher was officially declared a threatened subspecies in March 1993. This past May, however, a federal judge took the bird off the list. Why? The court ruled that the U.S. Fish and Wildlife Service (USFWS) didn't follow the proper listing procedures.

But procedures aside, there's no real question of the bird's threatened status—scientists estimate that up to 90 percent of its habitat has been lost to development. So on June 16 the gnatcatcher was temporarily reinstated as a threatened species. The ruling means protection not only for the 6-gram songbird, but for its unique coastal sage scrub habitat.

The reinstatement opened a 100-day period in which the USFWS will accept further public comments on the listing. Stay tuned to see which way the ball bounces.

COMPILED BY CYNTHIA BERGER

BEGUILED BY BIRDS

by James L. Hayward

For author, artist, and scientist Paul Johnsgard, a lifetime passion has fueled a prolific career

"I spent the first thirty years of my life learning to be a scientist, and the next twenty-five years of my life trying to become a humanist and an artist." Paul Johnsgard immerses himself in several worlds, but for the eclectic teacher, writer, artist, and scientist, these worlds merge in a burst of feathered movement, color, and shape. Johnsgard is beguiled by birds.

As a professor of biological sciences at the University of Nebraska with full teaching responsibilities, Johnsgard has managed to write at least one or two books on birds each year. In 1986 I asked him if he thought he'd ever equal the prodigious output of Arthur Cleveland Bent, an earlier bird biographer. "Oh," he replied nonchalantly, "I passed up Bent some time ago." Indeed, Johnsgard is the most prolific author in the history of ornithology. His volumes dominate the ornithological collections of most libraries.

Johnsgard's passion for birds developed when he was a boy growing up in North Dakota. His family was of modest means, but his mother encouraged her son to appreciate the natural world. He collected rocks, minerals, and plants, tended a wildflower garden, and learned to identify birds using his mother's set of Reed bird guides. He also recalls that his first-grade teacher had a mounted, male Red-winged Blackbird in a glass case. "I can remember that as if it were yesterday," he says. "I think that was an important aspect of wanting to see birds up close."

When Johnsgard was eight, his family moved to Wahpeton, south of Fargo, a town big enough for a public library. Like most boys his age, young Paul liked adventure stories, but he had a special fondness for natural history books, particularly those on mammals and birds.

"I was very shy, very self-contained," Johnsgard remembers. "My idea of having fun was going off in the woods and looking for wildflowers or watching birds. I was quite content just being by myself. I was no good at intramural sports so I spent a lot of time in the library, a lot of time drawing, a lot of time reading." He also took up photography and began chronicling his wildlife pursuits on black-and-white film with a 35mm Exakta camera.

A distant cousin, Bud Morgan, introduced Paul to the more professional aspects of biology. Morgan, a game warden, began taking the boy on spring duck counts and helped him identify the different species. A few years later, when Morgan became director of the North Dakota Game and Parks Department, he published one of Paul's photographs of pintails on the back cover of *North Dakota Outdoors.* This was Johnsgard's first "publication."

After finishing high school and two years of junior college in Wahpeton, Johnsgard enrolled as a zoology major at North Dakota State University with the intention of entering wildlife management. One of his professors, Frank Cassel, a Cornell University graduate, saw potential in the eager student and encouraged him to consider a career in ornithology. Johnsgard was surprised but delighted to learn that a person could study birds for a living. He decided he would specialize in waterfowl biology.

Johnsgard chose to do his master's degree at Washington State University. For his thesis he examined how changes in water levels brought about by the recently constructed O'Sullivan Dam affected bird populations in the Potholes region of central Washington. He also collected data on sex ratios and courtship rituals among waterfowl of the region. Johnsgard reported his observations in an article for the journal *Condor* in 1955, illustrating the piece with his own drawings, a practice that was to become standard in later years.

The *Condor* article caught the attention of Cornell University's Charles Sibley, who at the time was studying the evolution of duck behavior. "It was an interesting paper," wrote the Cornell professor to Johnsgard, "but you obviously are not aware of the work of Konrad Lorenz, who published a very extensive paper on courtship behavior in the dabbling ducks." After chastising the embarrassed young scientist for the oversight, Sibley invited Johnsgard to consider doing a Ph.D. under him at Cornell.

Johnsgard was elated with the prospect. Cornell enjoyed a distinguished

A selection of books by Paul Johnsgard

Dragons & Unicorns: A Natural History. New York: St. Martin's Press; 1982.

The Hummingbirds of North America. Washington, D.C.: Smithsonian Institution Press; 1983.

The Cranes of the World. Bloomington, Indiana: Indiana University Press; 1983.

Diving Birds of North America. Lincoln, Nebraska: University of Nebraska Press; 1987.

North American Owls. Oxford: Oxford University Press; 1988

Hawks, Eagles and Falcons of North America. Washington, D.C.: Smithsonian Institution Press; 1990.

Crane Music. Washington, D.C.: Smithsonian Institution Press; 1991.

Bustards, Hemipodes and Sandgrouse: Birds of Dry Places. Oxford: Oxford University Press; 1991.

Arena Birds: Sexual Selection and Behavior. Washington, D.C.: Smithsonian Institution Press; 1994.

reputation, and many of North America's prominent bird specialists had worked there—Arthur Allen, Peter Kellogg, Albert Brand, and Frank Chapman. Moreover, Sibley's work on the origins of avian diversity was attracting serious attention from the biological community. With Sibley's endorsement, Johnsgard was accepted to Cornell.

Under Sibley's mentorship, Johnsgard tackled a problem involving the origins of six closely related ducks—the Mallard, Black Duck, Florida Duck, Mottled Duck, Mexican Duck, and New Mexican Duck. After an impressive piece of ornithological detective work, Johnsgard concluded that the six varieties represent only two closely related species, the Mallard and the Black Duck. The other four types are merely subspecies of the Mallard.

Upon completing his Ph.D., Johnsgard headed to England for a two-year post-doctoral fellowship at the Wildfowl Trust in Gloucestershire, England. Peter Scott, founder of the trust, had assembled most of the 145 living species of ducks, geese, and swans at the facility. Johnsgard was in his element. He analyzed the behavior of 133 species of these birds, a gargantuan project that provided data for a bevy of technical papers. Most importantly, this experience culminated in what has since become a classic reference work: Johnsgard's *Handbook of Waterfowl Behavior,* published by Cornell University Press in 1965.

"There is no doubt that Professor Johnsgard's work will be widely acclaimed as a fine achievement," reported the *New York Review of Books.* "[It] should be in the library of everyone with an interest in keeping waterfowl. Taxonomists in our great museums cannot afford to ignore it." This unexpected but unequivocal endorsement by a leading literary magazine catapulted Johnsgard from the obscurity of field biology to the world of editors, publishing awards, and book signings. Johnsgard began to view himself as a writer as much as a biologist.

During his last year in England, Johnsgard received a letter from Sibley suggesting that he apply for a teaching job at the University of Nebraska, where a position had opened up in the zoology department. Johnsgard had never been to Nebraska, though he knew it was a good state for waterfowl. He applied for and got the job without so much as an interview and has been there ever since.

A photograph of pintails was Paul Johnsgard's first "publication." Thirty-three books later, he's still documenting bird behavior.

Johnsgard's years at the University of Nebraska have been good to him. In the late 1960s he earned the university's Distinguished Teaching Award. This was followed by a Regents Professorship and the Outstanding Research and Creative Activity Award. Other honors and awards include two National Science Foundation grants, a Guggenheim Foundation Fellowship, the Fulbright-Hays Award, the Mari Sandoz Literature Award, and the Loren Eiseley Award. Most importantly, Johnsgard's professorship has served as a support base for production of his 33 books, one for every year he's been on the faculty.

Johnsgard's best prose reflects the influence of Henry David Thoreau, Aldo Leopold, and Annie Dillard. For example, reading of a wounded Snow Goose downed by buckshot in his fictional work, *Song of the North Wind,* we feel Johnsgard's deep passion, sense of mystery, and appreciation of life:

> *Lying helplessly on her back, feet still uselessly paddling the air, she cannot see that the bloody wound on her abdomen has stained her entire underparts with red. Drawing on her last remaining strength, she raises her head and through dimming eyes gains a final glimpse of white-headed father passing above. Then her feet slowly cease their paddling, her body gives a final convulsive quiver, and she is dead. Overhead, white feathers torn from her body by the fusillade of gunfire still drift in the wind, eventually settling and floating as lightly as phalaropes on the surface of the lake.*

In 1984 Johnsgard found himself wounded, downed by a near-fatal heart attack in his Lincoln office. The lean, active nonsmoker seemed an unlikely candidate for heart disease. But lying in a hospital bed soon after the attack, he realized that eight books were probably too many to work on at one time. Upon returning home he temporarily put aside his demons and carved the life-sized Trumpeter Swan that now hangs from his office ceiling.

Johnsgard recovered with remarkable speed and a decade later continues to exude boundless energy. I called him recently to find out about his latest projects. "My book on arena behavior just came out," he said. "Another book concerning the natural history of the Nebraska sandhills should be out in a few months. It's in the form of narrative poetry, so it's been harder to write." Other books in preparation deal with the biology of stiff-tailed ducks and a world review of brood parasitism. He plans to "retire" in 1996. Maybe after that he'll travel to develop new ideas for more books.

"I wouldn't change my life in any way," says Johnsgard. ■

James Hayward teaches biology at Andrews University in Berrien Springs, Michigan.

Spotlight

HELPING THE HOMELESS

by David Wilcove

The Guam Kingfisher has found shelter at the zoo. But can it ever go home?

I was very pleased with my first sighting of a Guam Kingfisher—an all-but-extinct subspecies of the Micronesian Kingfisher. The bird was perched on a sapling six feet above the ground. Even without binoculars I could see its rusty face and underparts, its sky-blue back and wings, and the dapper black stripe curving around its nape. For no logical reason, I always expect endangered birds to behave differently—perhaps show a bit of anxiety about their precarious existence—but of course they don't.

This particular Guam Kingfisher, at the time one of only 29 left on Earth, simply sat on its branch and looked around. It didn't seem to mind the hundreds of people milling around, yelling and laughing, pushing and shoving. But that's life in the Bronx Zoo, I suppose. From the kingfisher's perspective, living in a cage was a lot safer than living on the Pacific island of Guam. Ten years later, that's still the case, which makes the Guam Kingfisher one of an increasing number of homeless birds.

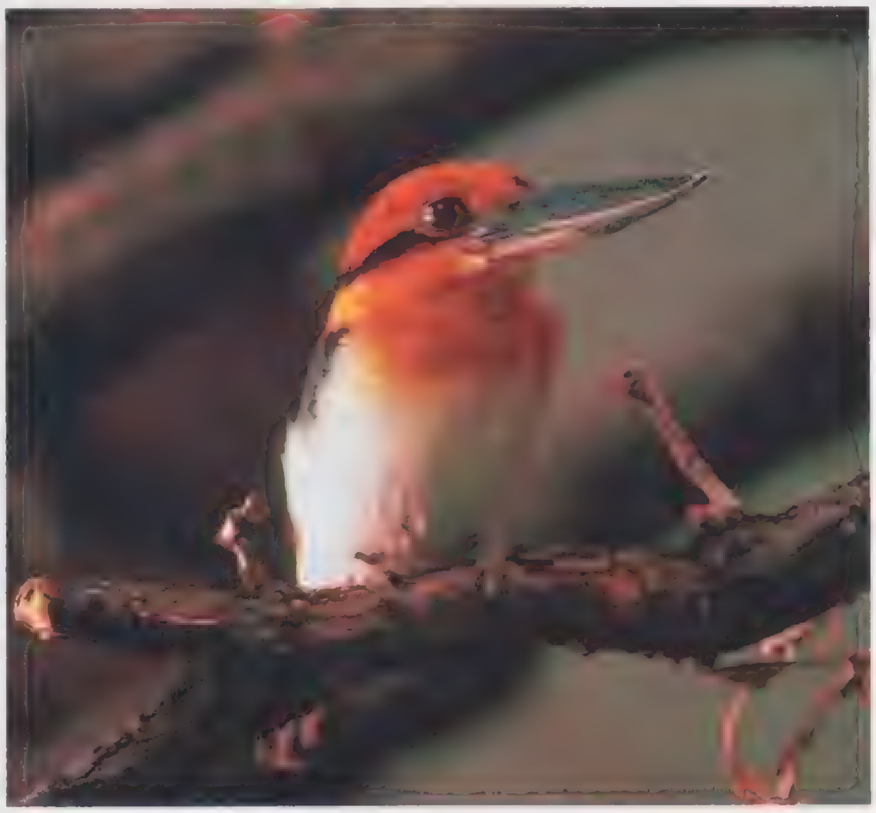
How the kingfisher lost its home is a familiar story—with a twist. Anyone who has watched a feisty starling evict a bluebird or woodpecker from a nest site knows that most introduced species do far more harm than good. But who could have imagined the ecological hell that would befall the birds of Guam when brown tree snakes from New Guinea were accidentally released there?

Finding themselves on a little island with no natural predators, parasites, or diseases, the snakes exploded in numbers, reaching densities of up to 30,000 per square mile. They slithered into houses, sneaked up toilet drain pipes, attacked children and pets, and caused power outages by crawling into the electrical transformers atop utility poles. And they ate birds. Lots of birds. Within the space of a few decades, the snakes ate to extinction virtually every native forest bird on Guam.

Two birds that narrowly escaped were the Guam Rail and the Guam Kingfisher. A few decades ago, both species could be found throughout the island, but by the early 1970s they had disappeared from southern Guam, victims of a mushrooming snake population. A survey conducted in 1981 estimated that 2,300 rails and 3,023 kingfishers remained on the northernmost part of the island. But the snakes were unstoppable, and within three years both bird species were down to a handful of individuals. Between 1983 and the beginning of 1986 biologists staged a Dunkirk-like rescue, bringing 29 kingfishers and 21 rails into captivity. Shortly thereafter, snakes consumed the last wild rails and kingfishers. The future of both species now lay in the hands of a few zoos charged with the awesome responsibility of perpetuating these birds.

What happened next is a textbook example of the ups and downs of captive propagation. The rails took splendidly to life in captivity. Some began breeding when they were only five months old. In at least one case a pair laid a second clutch of eggs while still feeding three-week-old chicks. Today, approximately 180 of the rails live in captivity.

The kingfishers have been a more difficult case. The captive population grew to 62 birds by August 1990 but suffered major setbacks in 1991 and 1992 when few of the pairs bred, more than a dozen adults died, and half the chicks perished shortly after hatching. The population dropped to 48 individuals. It has since inched up to 54 birds—a long, long way from the U. S. Fish and Wildlife Service (USFWS) goal of 200 to 250 individuals. In a 1993 report, the American Zoo and Aquarium Association's Species Survival Plan coordinator somberly concluded, "[We] have seen great excitement and optimism for the success of the program turn to extreme concern for the future of the species."


MIKE GREER/CHICAGO ZOOLOGICAL SOCIETY

Many captive breeding programs face the Guam Kingfisher's dilemma: If no wild habitat remains, where do we put these birds?

What went wrong? There is no single problem bedeviling the Guam Kingfisher program. It has suffered from the setbacks and mistakes that befall even the best efforts at captive propagation of rare species (and the Guam program has been, on the whole, a very good effort). Because most zoos have limited space, the birds are distributed among many institutions. Unfortunately, that means that most zoos have only a pair or two to work with, providing few opportunities to mix and match individuals to find compatible partners. Shipping the kingfishers between zoos stressed the birds and boosted their death rates. Along the way, kingfishers in several zoos contracted avian tuberculosis, so strict measures had to be developed to prevent its spread. And in captivity, the birds have proved to be less-than-ideal parents. Some have taken to eating their newborn offspring, an especially nasty habit that may have arisen because zoos were feeding newborn mice to the adult birds. A hairless, pink mouse doesn't look all that different from a featherless, pink kingfisher chick.

One hopes these obstacles can be surmounted, but even if they are, a larger problem looms: Where do we put the kingfishers? For the immediate future, Guam remains an unacceptable release site. The snakes have resisted all efforts to find a chemical or biological control agent. Recently scientists from the National Biological Survey and the Ohio Cooperative Fish and Wildlife Research Unit succeeded in creating two snake-free zones totaling approximately five acres on Guam. But to do this, they had to erect over 2,400 feet of fencing and spend weeks eradicating the snakes within the enclosures—an expensive and time-consuming procedure.

Scientists might consider releasing the birds on the snake-free island of Rota, 30 miles north of Guam. But Rota is inhabited by the closely related Collared Kingfisher. Although the two birds might be able to coexist, scientists would prefer a release site without another kingfisher species. And even then we would be committing the same deed that got us into this mess in the first place: releasing a species on an island where it does not naturally occur. For the time being, the Guam Kingfisher must remain a refugee behind bars.

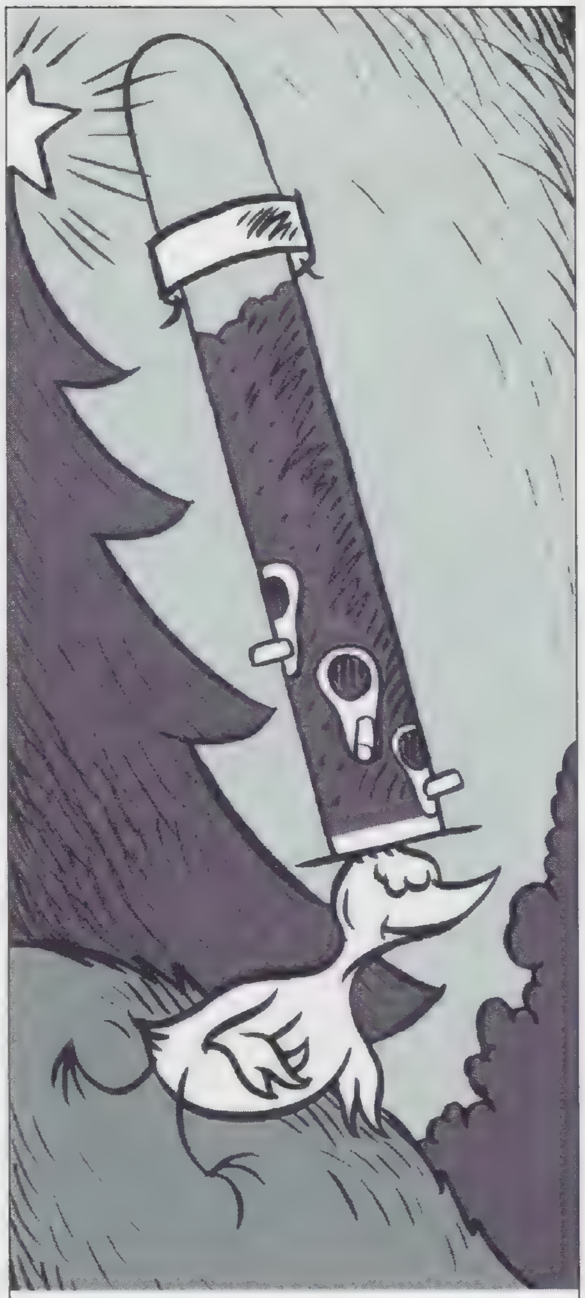
Even the fecund rails have proven to be something of a headache. They are incredibly aggressive and difficult to mix with other birds. Alone in a cage, they make an unspectacular exhibit (no surprise here—they *are* rails), so for a zoo to keep more than a pair or two entails a significant sacrifice of space and money. A few years ago, the USFWS tried to establish a population of Guam Rails on Rota, which has no indigenous rails. Unfortunately, the attempt failed when many of the rails were struck by cars while walking along a road near the release site. The USFWS plans to try again, and zoo curators no doubt have their fingers crossed, lest they be stuck forever with the feisty birds.

Although the circumstances surrounding the Guam birds are unique, their predicament is not. Both the San Diego and Los Angeles zoos, for example, have been fabulously successful in raising California Condors. But recent attempts to re-establish them in the wild have not gone smoothly. Some birds have collided with power lines—a not-so-subtle reminder that crowded Southern California is no longer optimal habitat for condors. The USFWS can breed Masked Bobwhites (an endangered subspecies of the Northern Bobwhite) by the thousands. But until recently it had nowhere to put them—their arid grassland habitat in Arizona had been destroyed by cattle. The 1985 purchase of a magnificent remnant grassland, now called the Buenos Aires National Wildlife Refuge, may solve the habitat problem, but the USFWS must still find a way to turn generations of captive bobwhites into wild birds.

Do these examples prove that captive breeding is a wasteful expenditure of time and money? Absolutely not—for without the good work of the zoos, there might not be any Guam Rails, Guam Kingfishers, California Condors, or Masked Bobwhites to fuss over. Captive propagation can be immensely valuable, but it is never a substitute for protecting natural habitats and wild populations. A Guam Kingfisher in a cage is better than no kingfisher at all. But it's a far cry from a wild bird perched on the branch of an old fig tree, on the lookout for a tasty gecko, living in a snake-free forest. ■

Further Reading

Mark Jaffe. *And No Birds Sing: The Story of an Ecological Disaster in a Tropical Paradise.* New York: Simon and Schuster; 1994.



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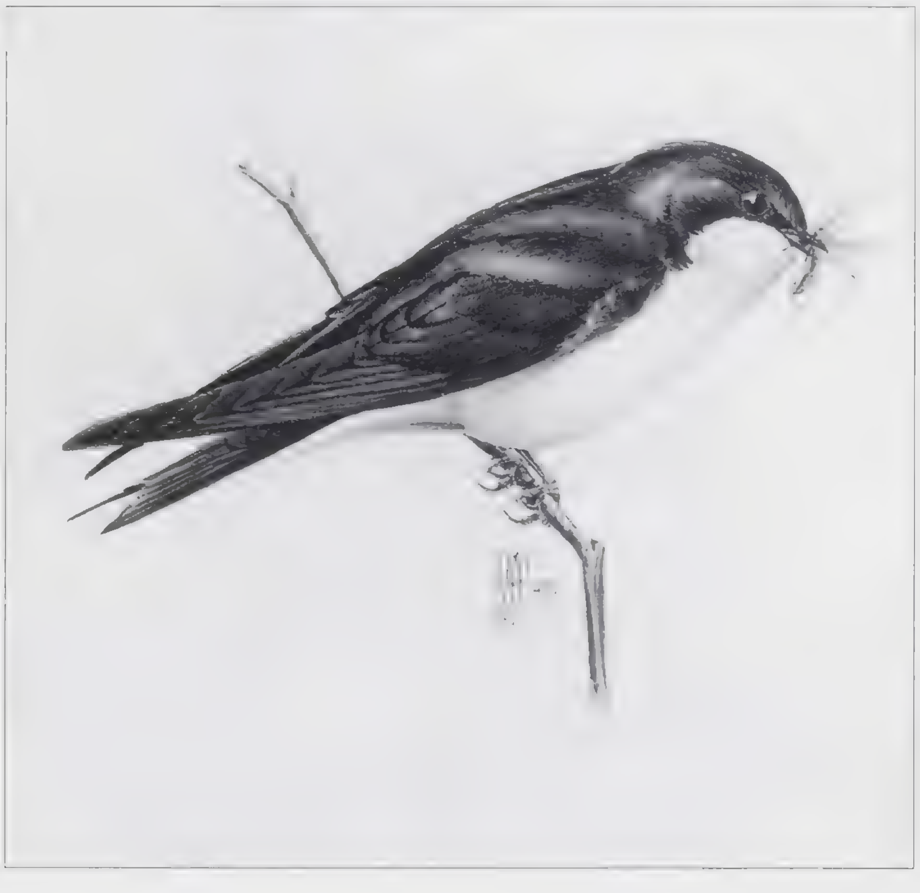
One Man's Treasure

by Cynthia Berger

The remarkable story of an art collection that was almost thrown away

If you've ever rescued a curbside treasure from an approaching trash truck, you'll appreciate this story. About a century ago, a young artist just beginning his career completed 108 illustrations for a book called *Citizen Bird.* Several years later the attractive gouache paintings were filed away in the basement of the publishing house, where they lay untouched for decades. Nothing in the files indicated the value of the paintings, so when the company moved to a new building they were earmarked for disposal.

You know what happened next. An employee saw the paintings, liked them, and asked if he could have some. Permission was granted; he took 36.



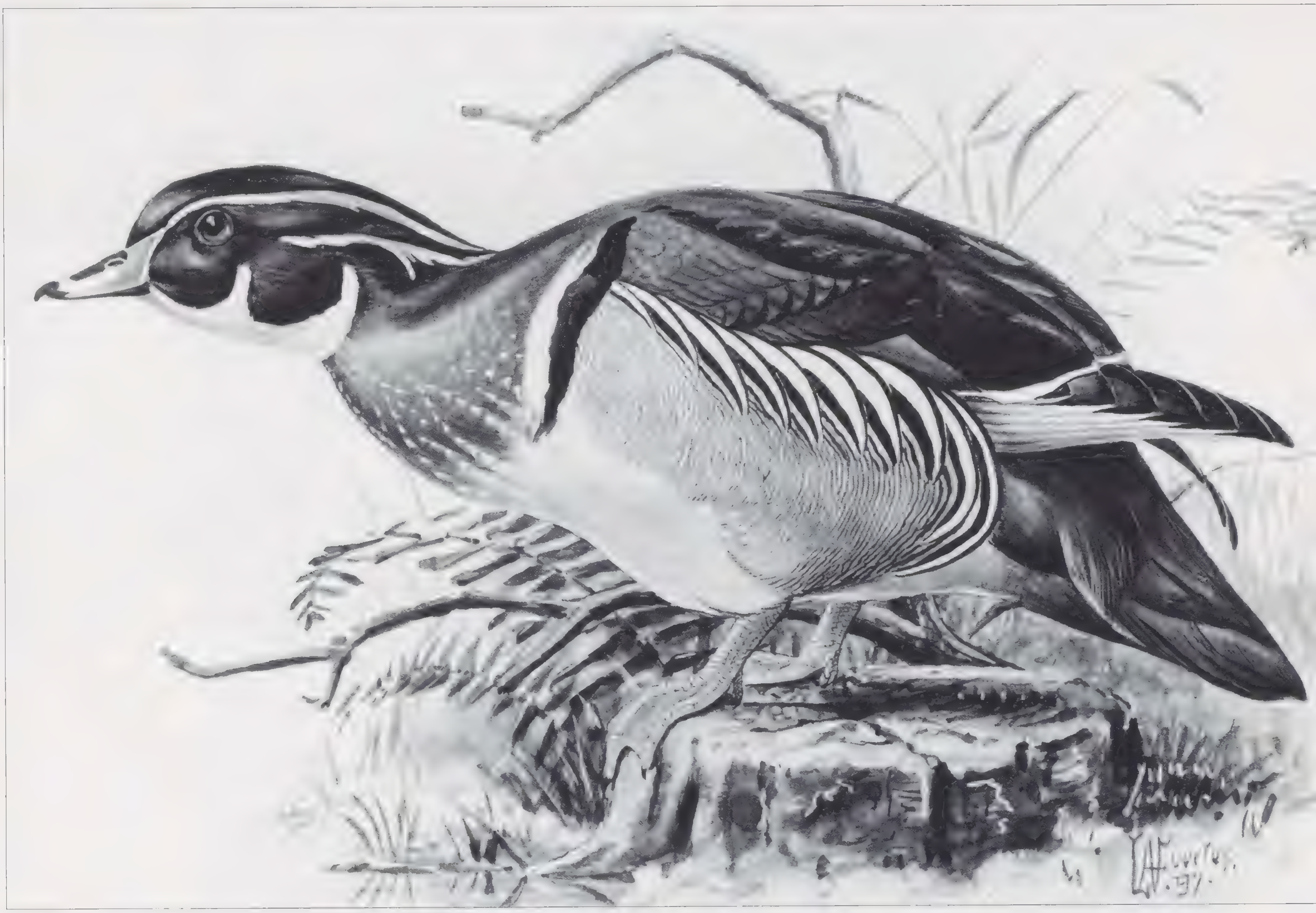
Years later, a few of the pictures, now framed, made a housewarming gift for his daughter and son-in-law, who were both avid bird watchers. The two cherished the pictures without attaching any special importance to the name of the artist . . . until one day the son-in-law happened to read a magazine article about the famed bird artist Louis Agassiz Fuertes. He suddenly realized that Fuertes was the same artist who had painted the illustrations that hung on his walls.

He contacted the Cornell Lab of Ornithology, which houses a major collection of Fuertes's art. Happy ending: the 36 black-and-white paintings are now on exhibit in the Cornell Lab of Ornithology's Stuart Observatory, generously loaned to the Lab by their owner.

A lucky rescue from oblivion isn't the only thing that distinguishes these charming illustrations. They were also the first major commission for the young artist; in effect, they launched his career. Fuertes painted them when he was only 22 and a senior at Cornell University.

A bit of serendipity brought the young artist this important commission. Fuertes was fascinated by birds and from a very young age devoted much of his time to studying and drawing them. His father, a Cornell professor, disapproved of this interest, saying it could never produce a comfortable income.

One fateful day a fellow Cornell Glee Club member offered to introduce



Even in his earliest works Fuertes showed an exceptional eye for the features that cinch an identification: a bird's shape, feather pattern, and typical posture. Thus the species depicted in Citizen Bird *are unmistakable, even though they are executed in black-and-white rather than the lifelike colors of modern field guides. Above, "Wood Duck"; far left, "Tree Swallow."*

Fuertes to his uncle, who was "crazy about birds." The uncle turned out to be Elliot Coues, the foremost ornithologist in North America at that time. To their first meeting Fuertes brought some of his best paintings, and Coues detected genius in the work.

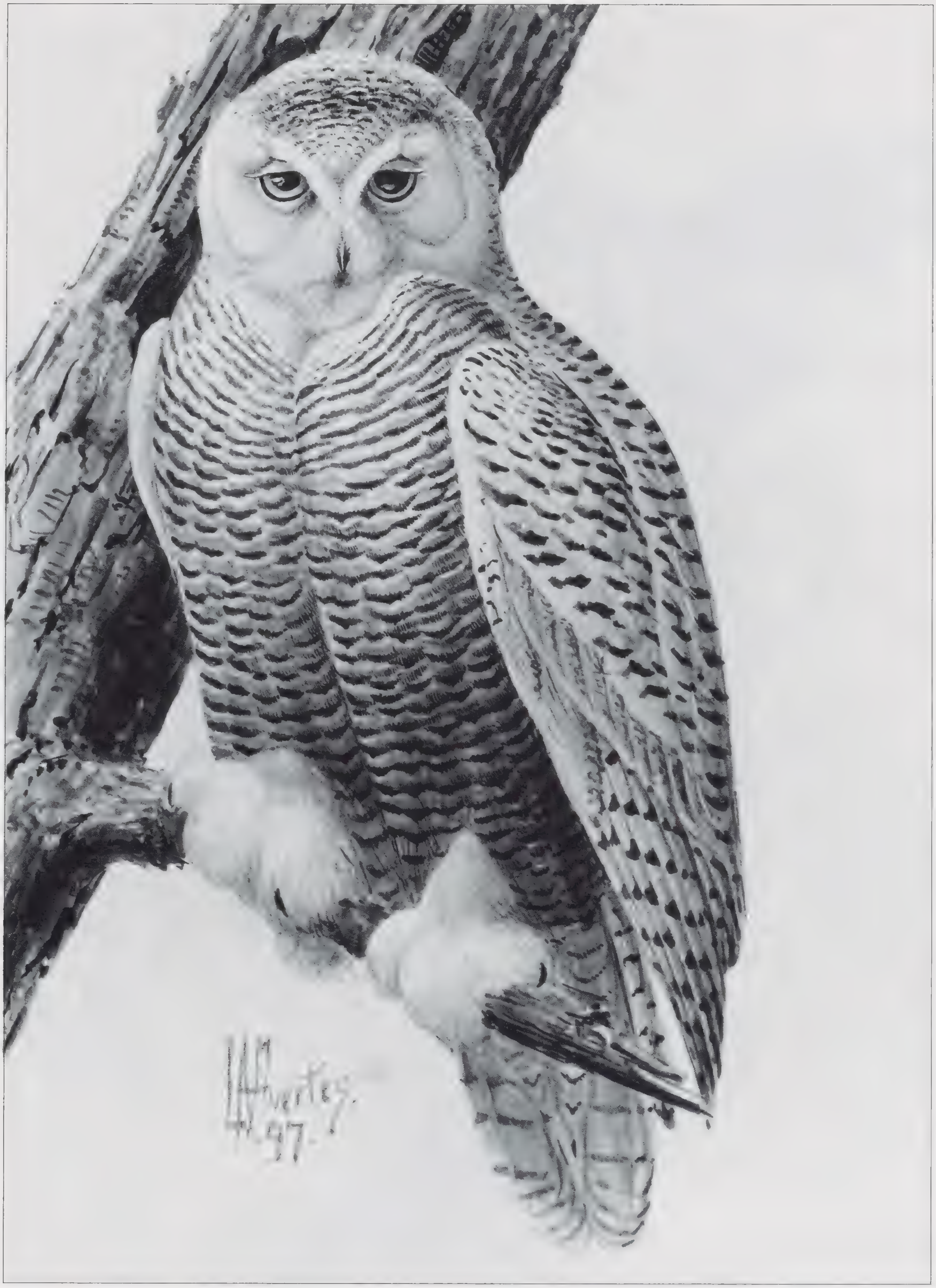
He recommended the young artist to his ornithological friends and even arranged for an exhibit of Fuertes's paintings at the 1895 meeting of the American Ornithologists' Union, where they were an immediate sensation. Fuertes received two small assignments as a result—a series of pen-and-ink drawings for the travelog, *A-Birding on a Bronco,* and four plates for a new ornithology journal, *The Osprey.*

Meanwhile, Coues was collaborating with author Mabel Osgood Wright on *Citizen Bird,* a bird guide for children. Meeting with the publisher to choose an illustrator, the ornithologist backed his protégé. And describing the outcome of the negotiations in a letter to Fuertes, Coues didn't mince words: "The publisher's choice lay between you and an artist of recognized ability and secure reputation; and I have such confidence in you that I have secured the offer for you. If this proposed arrangement can be made, and the result prove satisfactory, you will have been fairly started on the road to fame and fortune."

Fuertes produced the 108 illustrations over a period of eight months in 1896-97. The time-consuming work conflicted with his senior-year courses at Cornell. His father was displeased.

Finally *Citizen Bird* was published—and it was a success. "The book sells on sight," wrote Elliot Coues, "almost everybody that sees it wants a copy." The publisher paid Fuertes $1,000, a considerable sum in those days. Other commissions followed, and as Coues had predicted, Fuertes was "on the road to fame and fortune." ■

We are pleased to present this small sampling of the early genius of Louis Agassiz Fuertes. We invite you to visit the Lab to see the rest of the rescued Citizen Bird *illustrations, as well as the Lab's permanent Fuertes collection. Visiting hours at the Cornell Lab of Ornithology are from 9:00* A.M. *to 5:00* P.M. *Monday through Thursday, 9:00* A.M. *to 4:00* P.M. *on Fridays, and 10:00* A.M. *to 4:00* P.M. *on weekends and holidays. The schedule changes occasionally. To request a map with directions to the Lab, write to the Membership Department, 159 Sapsucker Woods Road, Ithaca, New York 14850.*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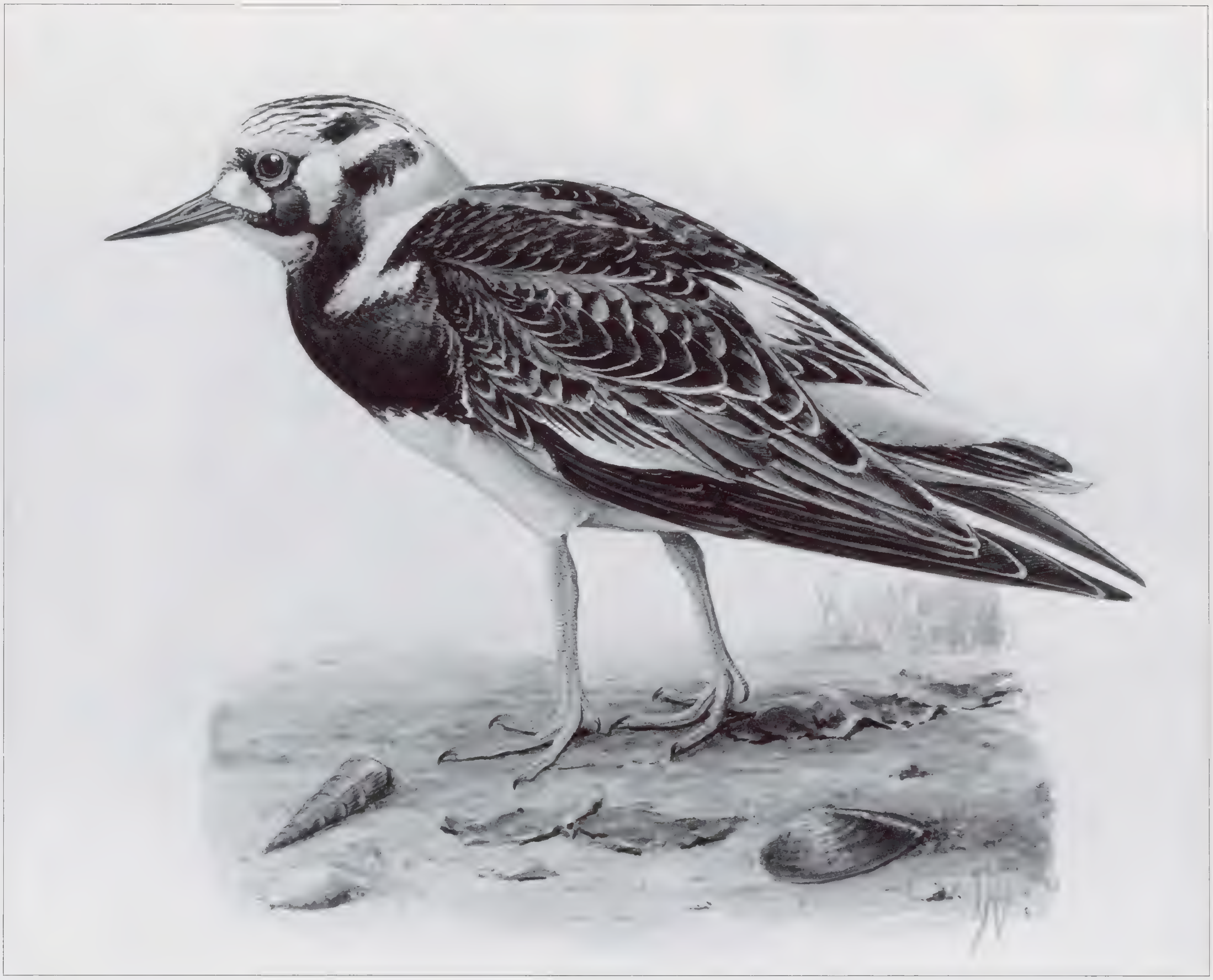
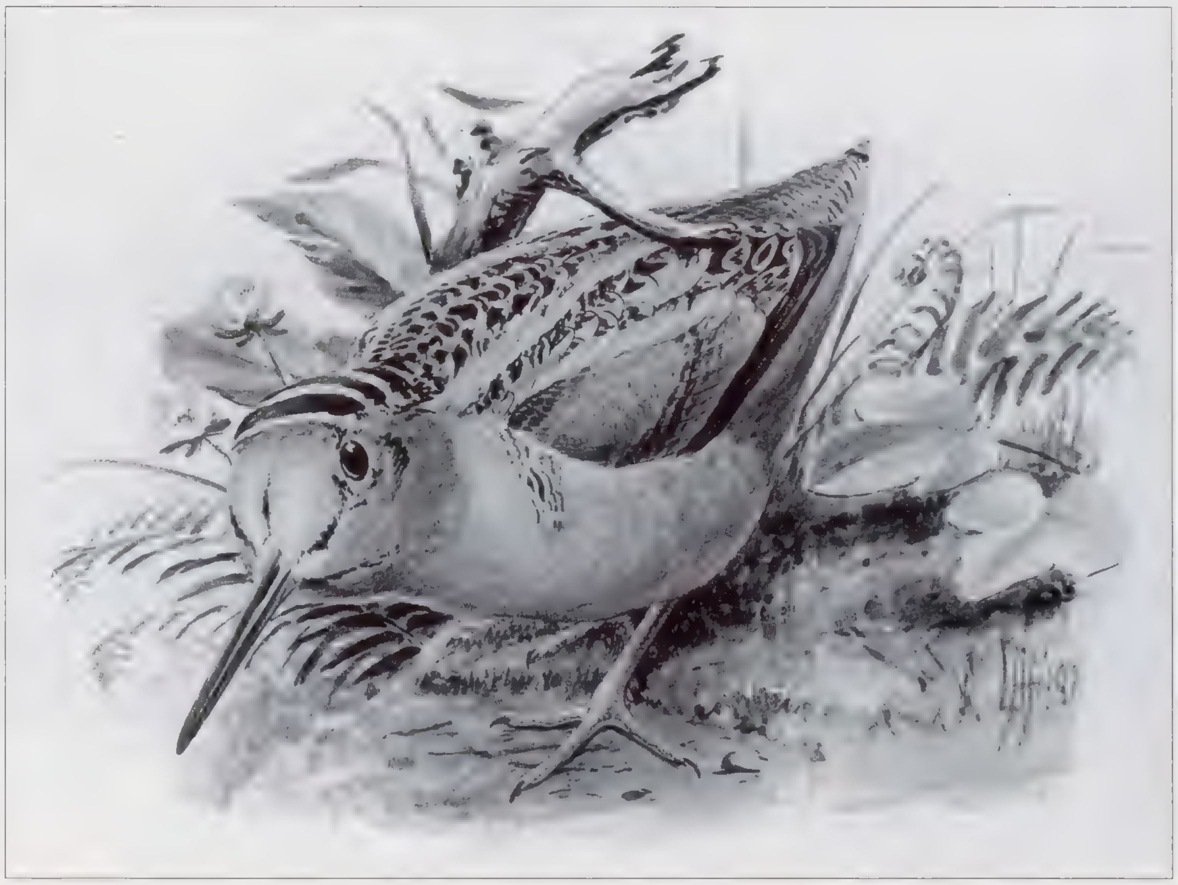


Ornithologist Elliot Coues gave Fuertes very explicit instructions for some of the Citizen Bird *illustrations. In one letter, he wrote, "You must do the Turnstone over again. . . . At present [it] has got its legs pulled about an inch too far. It would pass muster with ordinary drawings, but is not up to your own mark." The Ruddy Turnstone above is the successful response to this instruction.*

Coues also directed Fuertes to focus on the bird, not the background, writing, ". . . keep your accessories down *[emphasis in the original]. What we want is the bird, with least possible scenery." Today's art critics might not agree with these instructions; most say the artist's skill in placing birds in natural settings is one of his strengths. At left, "Snowy Owl"; at right, "Woodcock."*



Big Bird of the Namib

by Joseph B. Williams

Photographs by Rita and Charles G. Summers

How can the world's driest habitat support the world's largest bird?

The yellow orb of the noonday sun beamed down intense rays of heat as I stood on a prominent hill, peering through my binoculars at the vast gravel plain below. Before me stretched the Namib Desert of southern Africa, one of the driest places on earth. I had come to this game ranch, called Namib Rand, to study wild Ostriches.

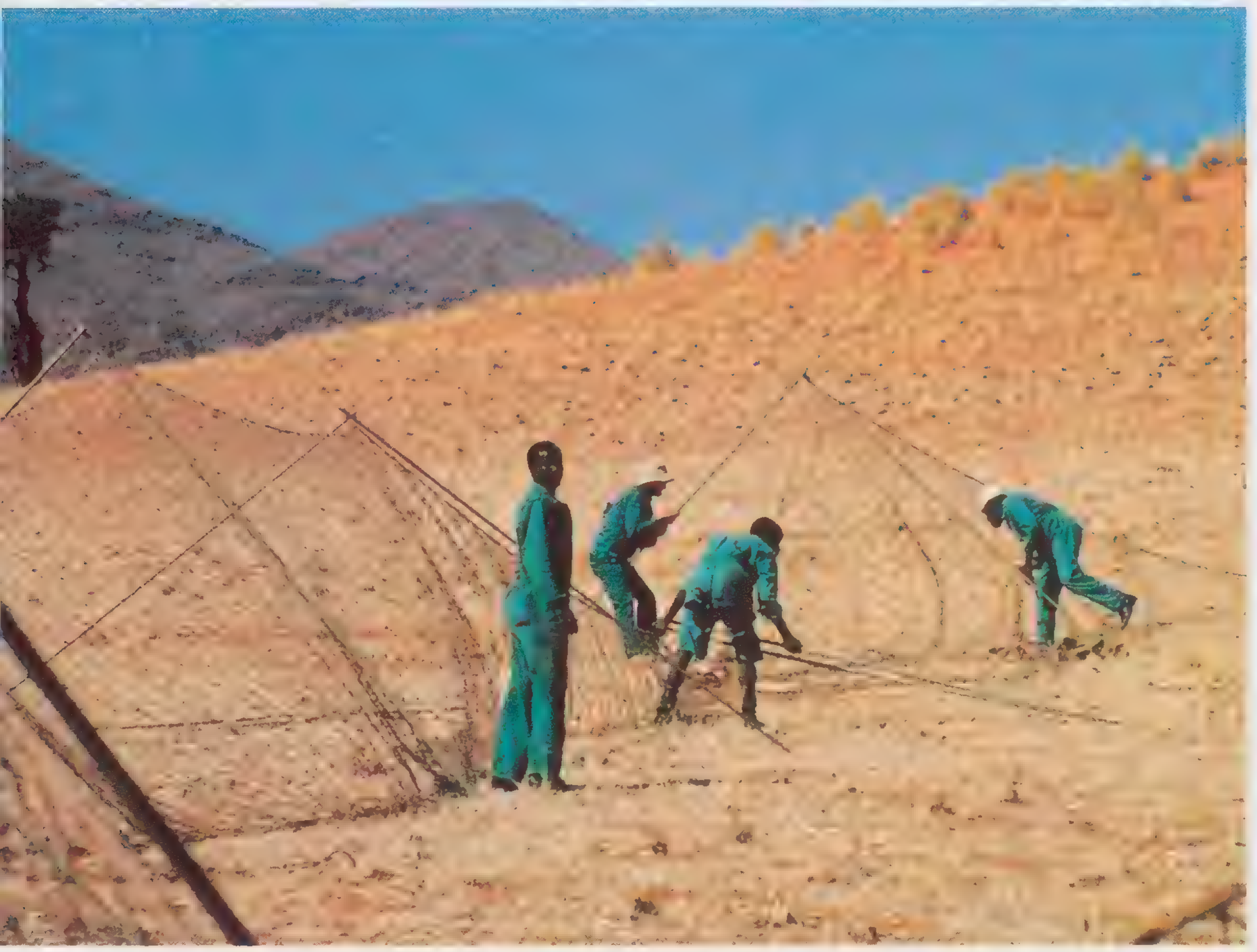
As I scanned for signs of animal life, heat waves shimmering up from the ground distorted my view. The expansive gravel plain, perhaps 20 kilometers wide and 30 kilometers long, was bounded on both sides by mountain massifs, creating a corridor that led westward to the Namib's dune sea. Dry watercourses, or washes, dissected the plain, creating a dendritic pattern of contrasting colors. The water of infrequent rains flows down these washes, so the soils there contain more moisture than the dry gravel plains. Within the washes I could see an occasional sprig of green grass, some shrubs with green leaves, and in the largest of washes, a few widely scattered small trees. Outside the washes, the plain was sparsely covered by brown perennial grasses, lying in wait for some future rain.

As I surveyed this region of low rainfall and scanty vegetation, I felt amazed that plant-eating animals—especially large ones—could live in such an austere environment. Yet several such species do live here. I spotted a gemsbok (a cow-sized antelope) and a somewhat smaller springbok standing motionless in the shade of some small trees, and a ground squirrel scurrying from one burrow entrance to another.

Then I noticed my first group of Ostriches, the birds that our team of scientists had come to study. Unlike the mammals, these birds weren't hiding in the shade of a tree or burrow. They strutted regally across the desert plain, occasionally pecking at plants on the ground. As I watched, a

Left, Ostriches forage in the heat of midday, a time when most other desert animals take shelter in the shade.

hundred questions raced through my mind. Why don't these birds seek shelter from the sun like the other animals? Are they really as stupid as folklore seems to suggest, or have they somehow adapted to endure the desert sun? How can the largest birds in existence find enough to eat in this bleak, hostile habitat? Do they need to drink water every day, or can they get enough moisture from their food? I thought it unlikely that they could obtain water from the dead vegetation that covered the gravel plain.



As the group of Ostriches entered a small wash, I saw that all the birds had oriented themselves with their heads pointing into the sun, the feathers on their backs erect, and their wings drooped low over their large, bare thighs. Clearly this pose was a form of behavioral temperature control: The erect feathers somehow reduced heat gain from the sun, and the wings served as built-in parasols, shading exposed areas of bare skin so that any breeze would enhance convection cooling. My Ostrich education had begun.

We were hardly the first humans to contemplate these birds. They have been exploited by humans for millennia. Five-thousand-year-old Bushman cave paintings depict an Ostrich hunt, a pictorial incantation to the gods for success. At about the same time, the ancient inhabitants of Mesopotamia, to the north, were using Ostrich eggs as water vessels.

Scientists think the progenitors of Ostriches evolved nearly 50 million years ago from crane-like ancestors that lost their ability to fly—though this idea remains controversial. Modern Ostriches first appear in the fossil record less than a million years ago.

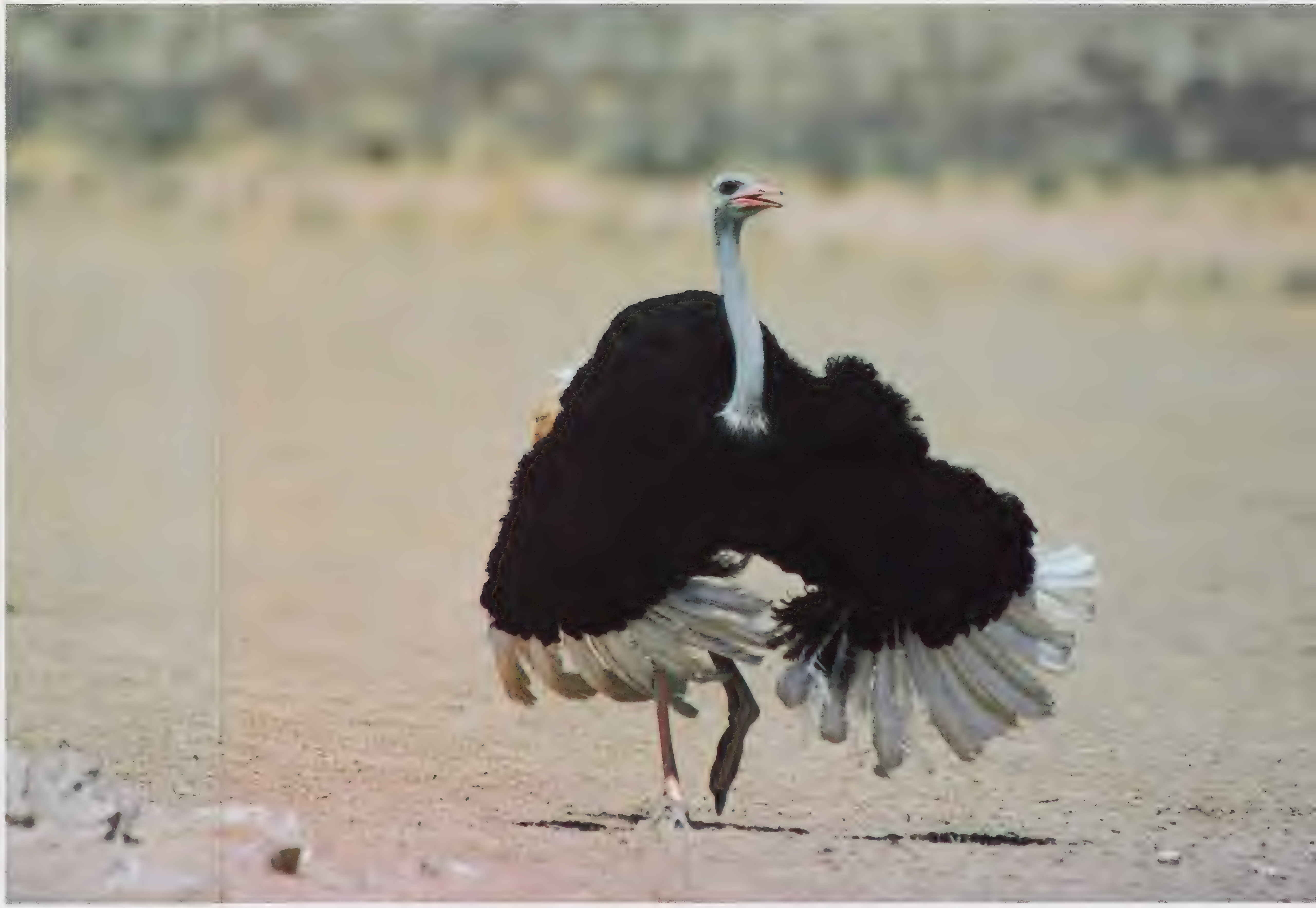
This magnificent animal is the largest living bird. Adults usually weigh between 70 and 100 kilograms, although some males weigh as much as 150 kilograms. They stand about 2.7 meters high and can run at speeds approaching 70 kilometers per hour. The sexes aren't identical: males have dark black feathers over most of the body, whereas females are a mottled gray color. Both have white tail feathers that are often soiled by dust bathing.

Once Ostriches lived throughout most of Africa, but their range has shrunk in modern times as a result of human depredation. In 1942 hungry Arabs shot the last remaining individual of a subspecies, the Syrian Ostrich. Ostrich populations in Namibia, Botswana, Kenya, and South Africa are strong and viable primarily because large game reserves protect them from humans.

Ostriches are interesting not only from a biological perspective but from an economic perspective. In the last two decades the domestic Ostrich industry has burgeoned in South Africa, Zimbabwe, Namibia, Australia, and the United States. Virtually the entire bird is used: skins are made into expensive leather goods; meat is sold in restaurants, as a low-cholesterol alternative to beef; feathers are made into dusters, and the remaining carcasses are pulverized to make animal feeds. In South Africa, the largest producer of Ostrich products, farmers rear about 180,000 Ostriches each year, bringing over $35 million in revenue to the country. In the United States a breeding pair of Ostriches sells for as much as $75,000.

Despite the Ostrich's biological and economic importance we know surprisingly little about Ostriches in their natural environment. For example, the species's natural diet has been poorly described. As a result, feeding programs for domestic birds often guess at the proper nutritional balance. Most Ostrich ranchers feed their birds dry food and water every day, but in the wild, Ostriches often travel miles from any known water source—suggesting that perhaps they don't need to drink so often.

Our team of scientists had three objectives for our Ostrich study. First, we wanted to measure how much energy and water these desert denizens use during their normal daily activities. Second, we wanted to determine the diet of wild desert Ostriches and explore the possibility that their foods supply enough water to meet their needs. And third, we were interested in the birds' daily activity patterns. We wanted to know how far they traveled in search of food each day.



This oversized "mist net," left, captured Ostriches for a study of their metabolism. Above, a male Ostrich performs a "broken wing" display to distract attention from the chicks he is tending.

PHOTOGRAPH AT LEFT: JOSEPH B. WILLIAMS

We used a procedure called the "doubly labeled water technique" to measure how much energy and water these birds use during their daily activities. An animal is captured and injected with a special kind of water containing deuterium (a heavy isotope of hydrogen) and oxygen-18 (a heavy isotope of oxygen). This water is nontoxic and harmless to birds. Then the animal is released to the wild. As it breathes out carbon dioxide and excretes waste products, some of the labeled materials are lost from its body. Finally the animal is recaptured some days later and a blood sample is drawn. By measuring the decline in the concentration of the isotopes, we can accurately estimate the animal's energy expenditure and water intake. The beauty of this method is that the Ostrich goes about its everyday, normal activities in its natural environment while the measurement is being made. Other techniques for measuring energy use require that the animal be restrained in a laboratory.

Still, capturing such a large and wary animal presented a real challenge. With their powerful legs and feet, domestic Ostriches have injured and even killed humans. Before this research endeavor, I had worked primarily on small birds that I captured with mist nests. I had to smile as I tried to envision wrestling a 100-kilogram Ostrich out of a mist net.

A local rancher suggested that we capture Ostriches by driving alongside a running bird, placing a shepherd's crook around its neck, then slowing our vehicle. John Wayne would have loved our first efforts. Imagine driving 70 kilometers per hour over rocky desert terrain alongside an Ostrich that's running this way and that like some giant mouse avoiding a broom . . . and then imagine putting a shepherd's crook around the bird's neck. Our attempts failed miserably. It looked like our research was doomed.

The Game Capture Unit of the Namibian Department of Nature Conservation came to our rescue. The team set up long drop nets that they normally use to capture African antelopes such as gemsbok. These nets, about three meters high and one kilometer long, are affixed to poles that collapse when an animal hits the net. We used vehicles to slowly herd Ostriches down natural corridors toward the nets. As we approached a net, we increased our speed, and the birds ran into the net. We removed the entangled birds and immediately placed socks over their heads. They calmed down right away, allowing us to maneuver them into special holding crates. In all, we captured two adults, a male and female each weighing about 90 kilograms, and four subadults, each weighing about 50 kilograms. We injected these birds with doubly labeled water, attached radio transmitters to their tail feathers, weighed them, and released them.

For the next eight days we followed our radio-tagged birds over the gravel plain of the Namib. We found that they were walking 10 to 20 kilometers per day in search of food. This mobility is probably the key to their success in desert environments. Unfortunately, in African countries with exploding human populations, more and more fences are being erected in Ostrich habitat, limiting the birds' ability to search for new patches of food and causing population declines.

We also determined that Ostriches are active only during the day; at dusk they find a raised position and roost there for the night. The quest for food consumes 80 percent of an Ostrich's day; preening, dust bathing, and sitting account for only one percent. During our observation period, Ostriches did not seek the shade of trees, though we often saw small antelopes sheltering from the sun in this manner. Most of the time the Ostriches foraged in the washes, where a few green plants grew. Some of these were small succulents, plants that are about 70 percent water.

Popular belief holds that Ostriches will eat practically anything—a notion fueled by the fact that domestic birds have been known to eat razor blades, bottles, nails, and long strands of barbed wire. Our study revealed that Ostriches actually are highly selective and consume only a few species of green plants, ignoring the more abundant dead vegetation. We concluded that over evolutionary time the Ostrich has adapted to traveling long distances in search of the few green plants that nature provides in the desert.

The Ostrich digestive tract is well suited to processing these meals. The system consists of an esophagus; a two-part stomach (the proventiculus, which stores plant materials and mixes them with enzymes and acids, and the muscular gizzard, where small stones grind coarse plants into fine particles); a small intestine that absorbs nutrients; and a pair of cecae—closed chambers, each two meters long, where bacteria break up complex molecules into simpler subunits. The cecae can produce 75 percent of the energy an Ostrich needs.

To better understand the Ostrich diet, we decided to act like Ostriches. Each one of us "foraged" for five hours, collecting all the green plants that we could find—especially ones that we knew Ostriches were eating. I spent five hot hours on my hands and knees, crawling over dry washes trying to collect green plants for laboratory analysis. In the end, to my chagrin, I collected only about 100 grams of green plants—barely a snack for an adult Ostrich, which typically consumes 4,500 grams of fresh plant food each day.

We were surprised to discover that Ostriches often pluck up whole plants and swallow both shoots and roots. Eating roots isn't an option for mammalian herbivores; the clinging sand would wear down their teeth and, as a result, shorten their life span. Because Ostriches grind their food in a gizzard, not with teeth, they can use a food source that's not available to large mammals such as the gemsbok.

Our study showed that an adult Ostrich burns about 18,000 kilojoules a day; it uses 70 percent of this energy walking the long distances to patches of green vegetation. Our calculations showed that the Ostrich burns its food calories efficiently; it expends less energy per unit of body mass than many other birds. An Ostrich-sized chicken probably couldn't survive in the Namib because it would need so much food. Somehow the process of evolution has lowered the Ostrich's metabolism, reducing its need for food—a useful adaptation for a desert bird.

We also found that adult Ostriches used about 3 liters of water per day. The two adult Ostriches we captured, however, got all their water from their food or from biological oxidation within their own bodies. They did not drink during the entire eight days that we measured their water intake. We saw other adult Ostriches drinking at a water hole, so these birds do come to water, but apparently they don't need to drink every day. This explains why you can find Ostriches in the Namib 50 kilometers from any known water source. As long as adults can find succulent foods, they need to drink only infrequently. Young birds may be more dependent on drinking water than are adults. The subadults we studied did drink water during our measurement period, about three-quarters of a liter per day.

Ostriches walk far each day in search of their favorite food—succulent desert plants that they eat roots and all. The meal provides all the moisture an adult ostrich needs; the male above may go for days without water, although his chicks probably need a daily drink from a desert water hole.

Edward Abbey once said, "There is something about the desert. There is something there which the mountains, no matter how grand and beautiful lack: which the sea, no matter how vast, does not have." For the vertebrate biologist that "something" is the array of adaptations that animals must possess to survive and reproduce in such a hostile environment. We learned much about Ostrich adaptations. They use less energy for their size than other birds, so they don't need as much food. So long as they can find succulent foods, they can go for long periods without drinking. They are highly selective in the foods that they eat, choosing green vegetation rich in protein and water. And they are highly mobile, able to travel long distances in search of food. What a marvelously adapted desert animal. ■

Joe Williams studies the ecological physiology of birds both large and small. He is an assistant professor in the Department of Zoology at Ohio State University.

Further Reading

Williams, J.B. et al. Field metabolism, water requirements, and foraging behavior of wild Ostriches in the Namib. *Ecology*, vol. 74, pp. 390-404; 1993.

A Book to Finish

Text and photographs by Robert McCracken Peck

An artist and a biologist join forces to produce the definitive series on South American birdlife

Even in the dry season, the weather is uncertain in the Ecuadorian Andes. So are the politics. After 25 years of work in South America as one of the world's preeminent neotropical ornithologists, Bob Ridgely knows about the uncertainty of both. He has dealt with hurricanes, landslides, hostile Indians, miles of red tape, and any number of tropical diseases in order to pursue his life-long love of birds. This afternoon he will add another gray hair to his prematurely silvered head, even as he is adding a new bird to the recorded avifauna of Ecuador.

It is a chilly 43 degrees Fahrenheit with a light drizzle blowing from the east. Bob is dressed in a thick hand-knitted sweater, yellow rain gear, and high-top rubber boots. We stand on the west slope of Ecuador's Andes, more than 9,000 feet above sea level. In the valley below us twists the Rio Isimanchi, and beyond that lies Peru. With hundreds of South American trips to his credit, Bob Ridgely has spent a good deal of time in Peru—and on this trip we have touched its fringes regularly while wandering back and forth across its unmarked border—but since

With two massive volumes of his epic work on South American birds yet to complete, Bob Ridgely pushes himself relentlessly. Above, he enters field notes from a long day of bird study into a laptop computer. Afterward he will probably return to the field, continuing to search for bird species well into the night.

the mid-1980s, when the Marxist "Shining Path" guerrillas began to permeate the country's remote mountain regions, he has chosen to focus his binoculars elsewhere. "I would rather not be shot," he comments matter-of-factly. "Besides, I have a book to finish."

Bob Ridgely, above left, was already working on his "magnum opus" 10 years ago, when he described the birdlife of Ecuador's Cordillera de Cutucu of southeastern Ecuador. At that time, this mountain range had not yet been explored by ornithologists. In the photograph above, taken during his 1984 expedition to the area, Ridgely and Frank Gill, chairman of the Ornithology Department at the Academy of Natural Sciences, show their exhaustion at the end of a day's survey.

The book that repeatedly draws him to the tropics and drives his 75-hour work weeks at Philadelphia's Academy of Natural Sciences is the exhaustingly ambitious, multi-volume *The Birds of South America,* which Bob is co-authoring with acclaimed bird artist Guy Tudor. It has brought us to this remote stretch of the Andes and into the nastiness of a late October storm.

For several weeks I have been traveling with Bob and some of his museum colleagues as they explore the Cordillera Las Lagunillas, a relatively unspoiled forest and paramo habitat 350 miles south of Quito, Ecuador. This is the home of the shy, nocturnal spectacled bear, the rarely-seen woolly mountain tapir, and of many unbelievably beautiful birds. Pearled Treerunners, Tawny-rumped Tyrannulets, Rainbow-bearded Thornbills, Black-tailed Trainbearers, Shining Sunbeams, Amethyst-throated Sunangels, Mountain Velvetbreasts—birds with English names as colorful as the creatures they represent—brighten the forests below us with dazzling displays of plumage and sound.

To Bob's evident satisfaction, we have just confirmed that this soggy, rocky, windswept grassland is also home to the Andean Flicker, a large, cinnamon-plumed woodpecker with yellow underwings and bold, black barring on its back. Until today, the bird had been known only from Peru south to northwestern Argentina. By finding it here, Bob has expanded the known limits of its range and added another bird to the 1,600 species Ecuadorians can claim as their own.

For 20 minutes we have been peering through successive waves of obscuring clouds to a 15-foot cliff face where the flickers have excavated a nesting hole. Now I see that Bob's attention is turned elsewhere. Hoping for another first, I follow the line of his binoculars into the valley below us. I see nothing but fog. Minutes pass. Silently the veil begins to lift and I spot the focus of his attention—a line of figures moving through the wet paramo grasses in single file. Less than 400 yards away, they march directly toward us with the precision of a military force. Each man carries an automatic weapon.

Just as I fix them in view, another cloud envelopes us in translucent mist, as though a giant film projector has finished its reel and drenched a valley-wide movie screen with a wash of imageless white. All is silent except for the whir of the wind through the knee-deep grass and the hissing patter of water droplets on my rain hood. I can see Bob 10 yards away, but only in silhouette. The other two in our party, Mark Robbins and Pancho Sornoza, are obscured by the mist.

We have been working in these mountains long enough to know that no one lives here. The closest town is a grueling 45-minute jeep ride away, up the valley. Though Shining Path guerrillas have not been reported this far north, I can think of no other possible identity for the armed men now snaking their way toward us.

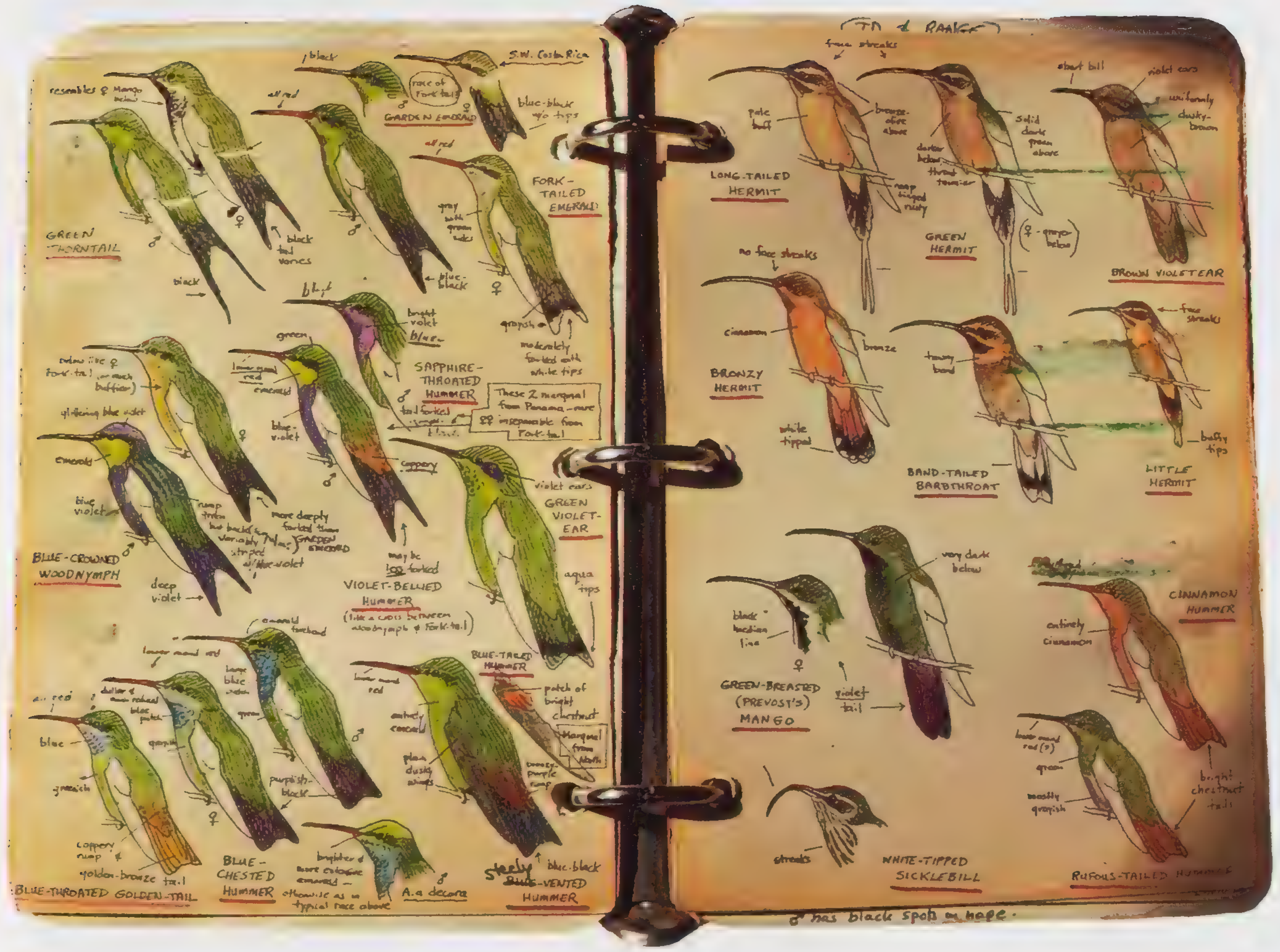
Bob and I move closer to discuss the situation. We wonder whether the men have seen our party, and if not, whether the clouds will remain long enough to allow us to slip undetected behind the concealing boulders of the mountain. We decide that the risk of sudden exposure is too great, just as the clouds blow past to reveal again the advancing line of men. They are now less than 100 yards away and closing. Bob takes a deep breath and walks past the boulders and into the open to meet them.

I remember when the hardest part of birding was just getting somewhere and trying to identify the birds," recalls Guy Tudor, Bob's stateside collaborator on *The Birds of South America.* "There were no birding tours," he says. "There weren't even field guides to a lot of the places I wanted to be." Guy's nostalgic reminiscence, delivered through a cloud of exhaled cigarette smoke, encompasses 30 years of pioneering fieldwork from Mexico to Patagonia. "Now you can get to lots of places, but there's much less to see . . . and the politics are horrendous! There are still parts of South America that I'd like to explore, but I'm not keen on slogging through Shining Path country. Bob can have that kind of travel. I feel safer here in New York."

Here in New York, for Guy, is a spacious, impeccably ordered apartment and painting studio in Queens. House Sparrows and House Finches chatter from the trees outside, and Long Island commuter trains rattle past the double-hung windows of his living room as I talk with him about birds, art, South America, and the book project that combines them all. The room is filled with prints and paintings of wildlife, whose disappearance he decries, produced by artists he admires: curassows by Al Gilbert, hummingbirds by Larry McQueen, a sheet of songbirds from Panama by John Gwynne, four small ground squirrels by famed turn-of-the-century naturalist Ernest Thompson Seton, and also paintings by Tudor himself. "I did a series of flightless bird paintings for the Darwin Centennial issue of *Life,*" he explains. "I've been kicking around with birds ever since.

While Tudor's work has run the gamut from mammals to the stars, it is his bird paintings that

The paramo of the Cordillera las Lagunillas, above, also in Ecuador, is a strikingly different habitat with an entirely different avifauna. Pictured from left to right, Pancho Sornoza, Mark Robbins, and Bob Ridgely scan the wild Andean terrain for rare or unusual bird species.


GREEN THORNTAIL
GARDEN EMERALD
FORK-TAILED EMERALD
SAPPHIRE-THROATED HUMMER
BLUE-CROWNED WOODNYMPH
VIOLET-BELLIED HUMMER
GREEN VIOLET-EAR
BLUE-THROATED GOLDEN-TAIL
BLUE-CHESTED HUMMER
STEELY-VENTED HUMMER
LONG-TAILED HERMIT
GREEN HERMIT
BROWN VIOLETEAR
BRONZY HERMIT
BAND-TAILED BARBTHROAT
LITTLE HERMIT
CINNAMON HUMMER
GREEN-BREASTED (PREVOST'S) MANGO
WHITE-TIPPED SICKLEBILL
RUFOUS-TAILED HUMMER

Guy spent countless thousands of hours committing to paper the subtle nuances of posture, shape, and color of the birds Bob was describing in prose

have earned him universal admiration. In 1990 he was awarded a coveted MacArthur "genius" award, with an accompanying six-figure, five-year stipend. The award enabled him to focus his attention on *The Birds of South America* project for which he has now completed 83 exquisitely detailed color plates representing 1,250 species of songbirds. Volume II of the projected four-volume series was published by the University of Texas Press earlier this year.

Tudor and Ridgely began their professional collaboration a little over 12 years ago, but their friendship dates to the early 1970s when they were introduced by Gene Eisenmann of the American Museum of Natural History, to whom their book is dedicated. Bob, just back from a two-year stint in the U.S. Army in Panama, was then working on his first book, *A Guide to the Birds of Panama,* with John Gwynne. Guy was illustrating Rodolphe Meyer de Schauensee's *A Guide to the Birds of Venezuela.* "Bob and I got along well right from the start," recalls Guy. "I admired his energy and his discipline. I thought, 'Here is someone who is going to get something done.'"

The match was a good one and in 1982 *The Birds of South America* series was launched, with Bob providing information on taxonomy, behavior, voices, habitat, and ranges of the birds (complete with distribution maps based on published sources and personal observations), and Guy providing meticulously researched illustrations.

Using preserved skins from the natural history museums in Philadelphia and New York, photographs from the Academy of Natural Sciences' VIREO collection (the largest collection of bird photographs in the world), and visual references from his own extensive files, Guy spent countless thousands of hours committing to paper the subtle nuances of posture, shape, and color of the birds Bob was describing in prose. Meanwhile Bob, with support from the Academy of Natural Sciences, World Wildlife Fund U.S., the International Council for Bird Preservation, Massachusetts Audubon Society, McLean Contributionship, RARE Center for Tropical Bird Conservation, and several private donors, was traveling the length and breadth of South America gathering information on the 3,500-odd species of birds that inhabit the ornithologically richest of all continents.

The attempt to scientifically document South

When artist Guy Tudor traveled to Costa Rica in the late 1960s, he was frustrated by the lack of published information on the country's birds. His solution: he created his own field guide in a loose-leaf notebook, above left and at right. Above, Bob Ridgely explores a highland area in Ecuador's Andes, near where his group encountered armed soldiers and a new species of cotinga.

BHL

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America's vast ornithological fauna began in the late 18th and early 19th centuries with the efforts of such now-obscure naturalists as Felix de Azara (1746-1821), a Spanish cleric and military engineer who described nearly 450 birds from Paraguay and northern Argentina while he was directing border surveys in the area; Alexander von Humboldt (1769-1858), the German aristocrat who traced the Orinoco River to its headwaters and was the first European to study the flora and fauna of the Andes; and Prince Maximilian zu Wied-Neuwied (1782-1867), who started to inventory the birds of Brazil from 1815 to 1817, but is better remembered today for his extensive travels in North America.

The British naturalists Alfred Russel Wallace (1823-1913) and Walter Bates (1825-1892) helped to bring the extraordinary biodiversity of the Amazon to the attention of a broader public world-wide, but it was American ornithologist Frank Chapman (1864-1945), curator of birds at the American Museum of Natural History from 1908 to 1942, who introduced the modern era of neotropical ornithology to South America.

To visually document his discoveries, Chapman enlisted the help of that era's preeminent bird artist, Louis Agassiz Fuertes (1874-1927). The birds they collected on a series of trips to Colombia in the first two decades of this century were among the thousands that Tudor and Ridgely consulted in the course of their research. Another major source of specimens for them was Melbourne A. Carriker, Jr. (1879-1965), who made many research and collecting trips to the Andes of Colombia, Bolivia, and Peru at about the same time.

While Bob Ridgely slogs through the rugged mountains and rainforests of South America to complete his work, artist Guy Tudor, pictured above, prefers to toil in the urban jungle of New York City. At right, a completed plate from Volume II of The Birds of South America, *depicting several species of antbirds.*

Chapman, Fuertes, Carriker, and others of their generation are said by many to have worked in the golden age of neotropical ornithology, when there were still many birds to discover and the montane and rain forests were still essentially intact. In many respects, the years before World War II did constitute a golden era, but it was certainly not the last. Thanks to improved transportation, better equipment, and an increase in the number of skilled birders, neotropical ornithology has enjoyed more activity in recent years than at any time in history. As a result, a surprising number of contemporary ornithologists—including the late Ted Parker, whose legendary career was cut short by a fatal plane crash in 1993—have described more than a dozen new species of neotropical birds since *The Birds of South America* project began.

Tragically, even as the number of known bird species are reaching new highs, neotropical bird populations are plunging to dangerous lows. Before *The Birds of South America* series is completed, habitat loss in the tropics seems destined to doom some of the very species we have only recently come to know.

As I watch Bob Ridgely approach the unknown column of soldiers, I realize that on this afternoon the birds' biographer may be in more imminent danger than his subjects. Though we assumed that they had seen us, the men seem startled by Bob's emergence from the fog. Two of them raise their guns. Bob waves slowly and begins to explain who we are. Although he did not study Spanish when he attended Lawrenceville School or Princeton University (the son of a Brown University French professor, his formal training had been stacked in favor of other Romance languages), his military service in Panama and subsequent years of travel in South America have given him a more than adequate command of the language. From the snatches of conversation I overhear, it is clear that his self-taught language skills and considerable charm have defused a potentially dangerous confrontation.

The men we have encountered, it turns out, are not Shining Path guerrillas, but part of the

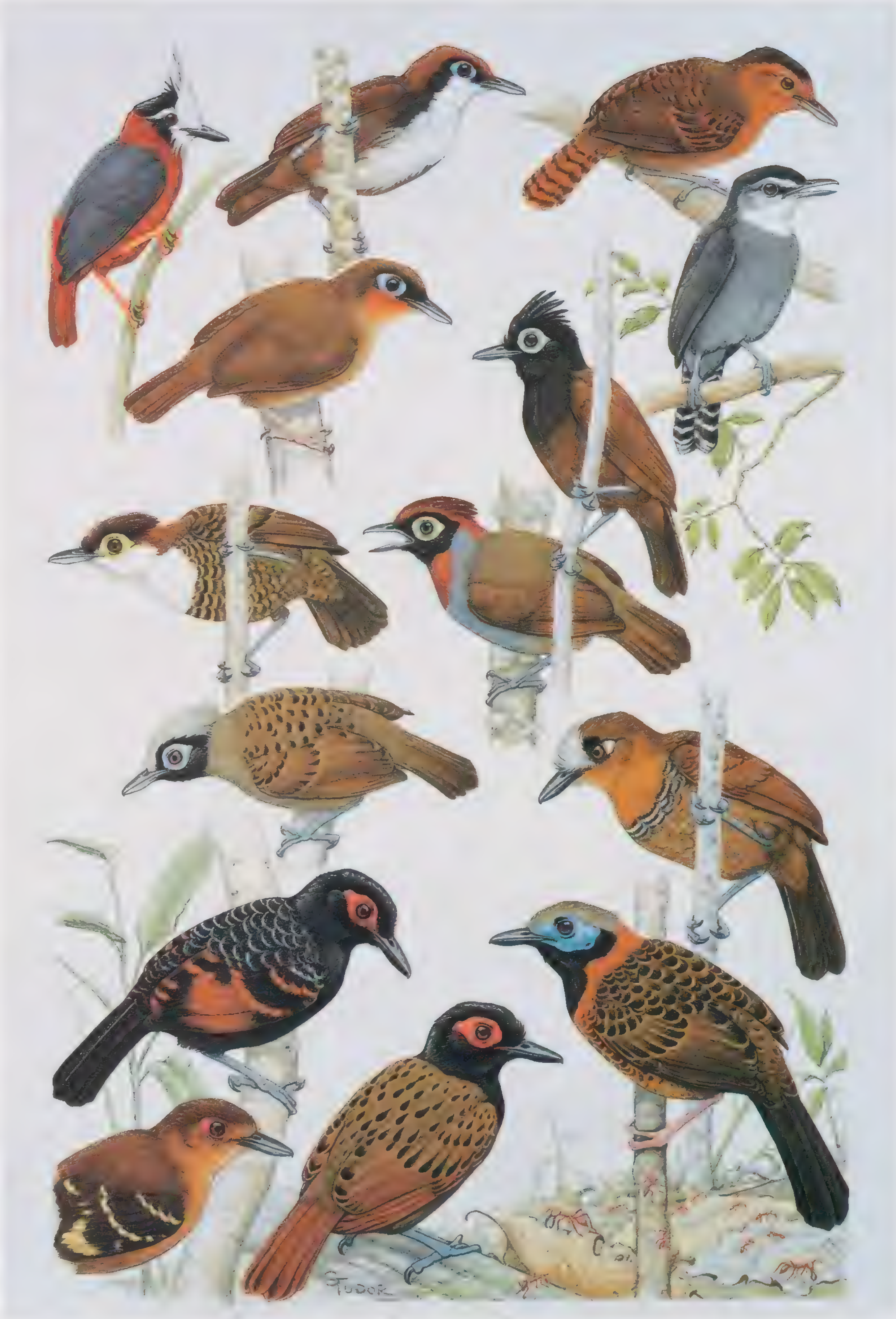
Ecuadorian Border Patrol, looking for would-be violators of their country's sovereignty. Gringo ornithologists, Bob convinces them, do not pose a serious threat. By the time that Mark, Pancho, and I join them on the hillside, the soldiers are smiling broadly, as relieved as we are that none of us are the Maoist revolutionaries we had imagined. We shake hands all around and part with best wishes on both sides.

When recounting the day's events to the rest of our party later, neither Bob, Mark, nor Pancho mention the armed encounter. They speak only of birds—the Andean Flicker and a new species of cotinga Mark has found in a mossy woodland far above camp.

Bob systematically enters the party's observations into a laptop computer and a number of well-worn field notebooks, then rushes off, tape player in hand, to comb the hillsides for Imperial Snipe. By 10:00 P.M. he will be calling owls to camp; by 11:00, seeking nightjars in the pallid light of a gibbous moon.

The field data that Bob and his colleagues gather on expeditions like this give his text in *The Birds of South America* tremendous value. The only previous attempt to document all of the birds of the continent in one book came in Rodolphe Meyer de Schauensee's landmark treatise of 1970, also titled *The Birds of South America.* Although based primarily on descriptions from museum specimens and previously published accounts, that book helped to catalyze much recent work in South American ornithology. Bob, Guy, and others have added significantly to the base that Meyer de Schauensee and his predecessors established, providing ecological, behavioral, vocalizational, and distributional information that earlier generations could only dream of knowing.

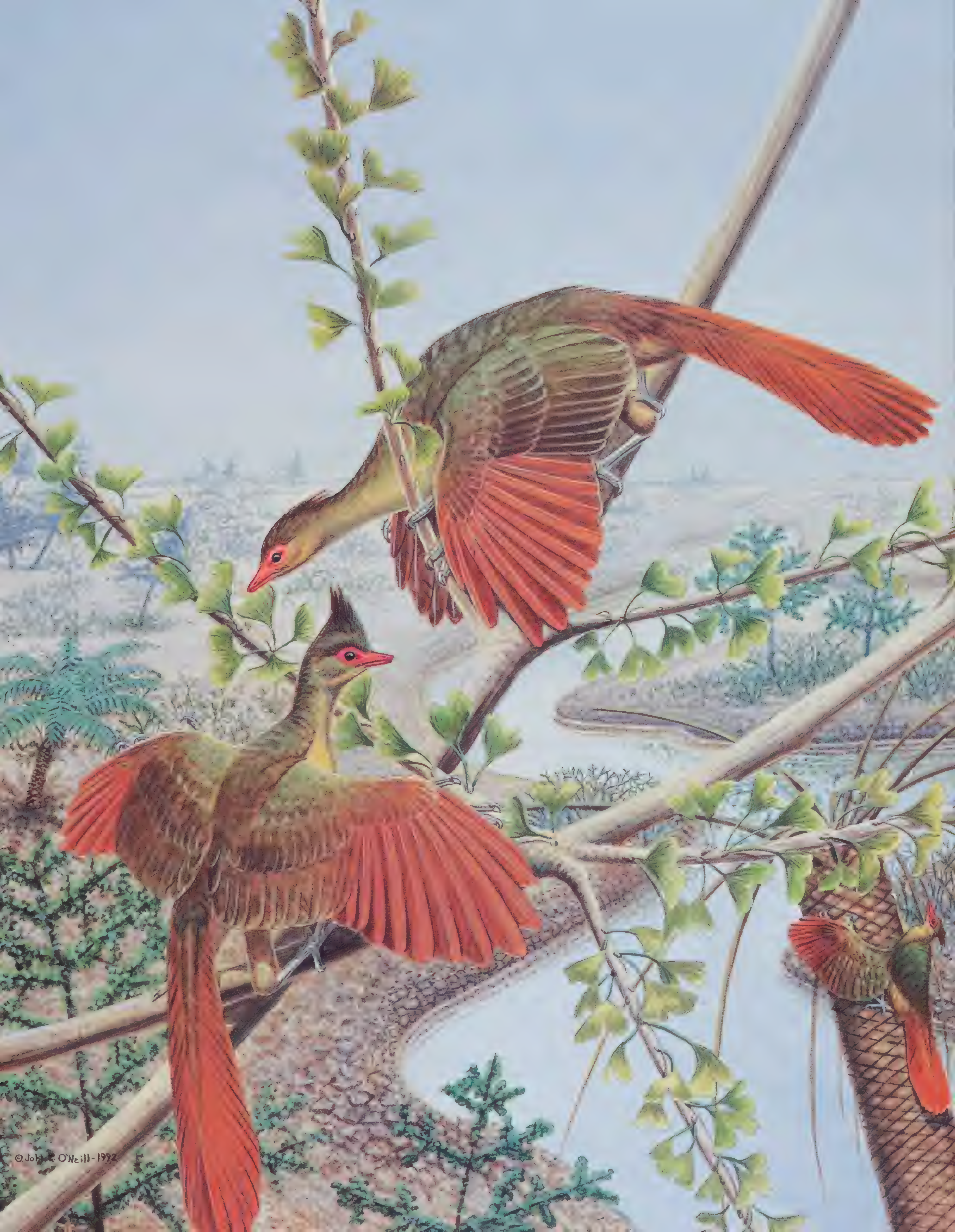
"There's still a lot to do," acknowledges Tudor, "and I may not live to see it finished." But with *The Birds of South America* volume II now on the shelf, they're halfway to the end and counting. ■



Illustrations by Guy Tudor. From *The Birds of South America, Volume II,* by Robert S. Ridgely and Guy Tudor. Copyright 1994 by Robert S. Ridgely and Guy Tudor. Reprinted by permission of the publisher, the University of Texas Press.

Robert McCracken Peck, Fellow of the Academy of Natural Sciences of Philadelphia, is a writer, naturalist, and historian who has participated in numerous research expeditions to South America. He is the author of A Celebration of Birds *(a biography of famed artist Louis Agassiz Fuertes)*, Land of the Eagles: A Natural History of North America, *and several other books.*

Volume I and the newly released volume II of The Birds of South America, *both published by the University of Texas Press, are available from the Crow's Nest Birding Shop at the Cornell Lab of Ornithology.*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The Great Dinosaur Debate

by Alan Feduccia

Did feather-powered flight evolve from the ground up . . . or from the trees down?

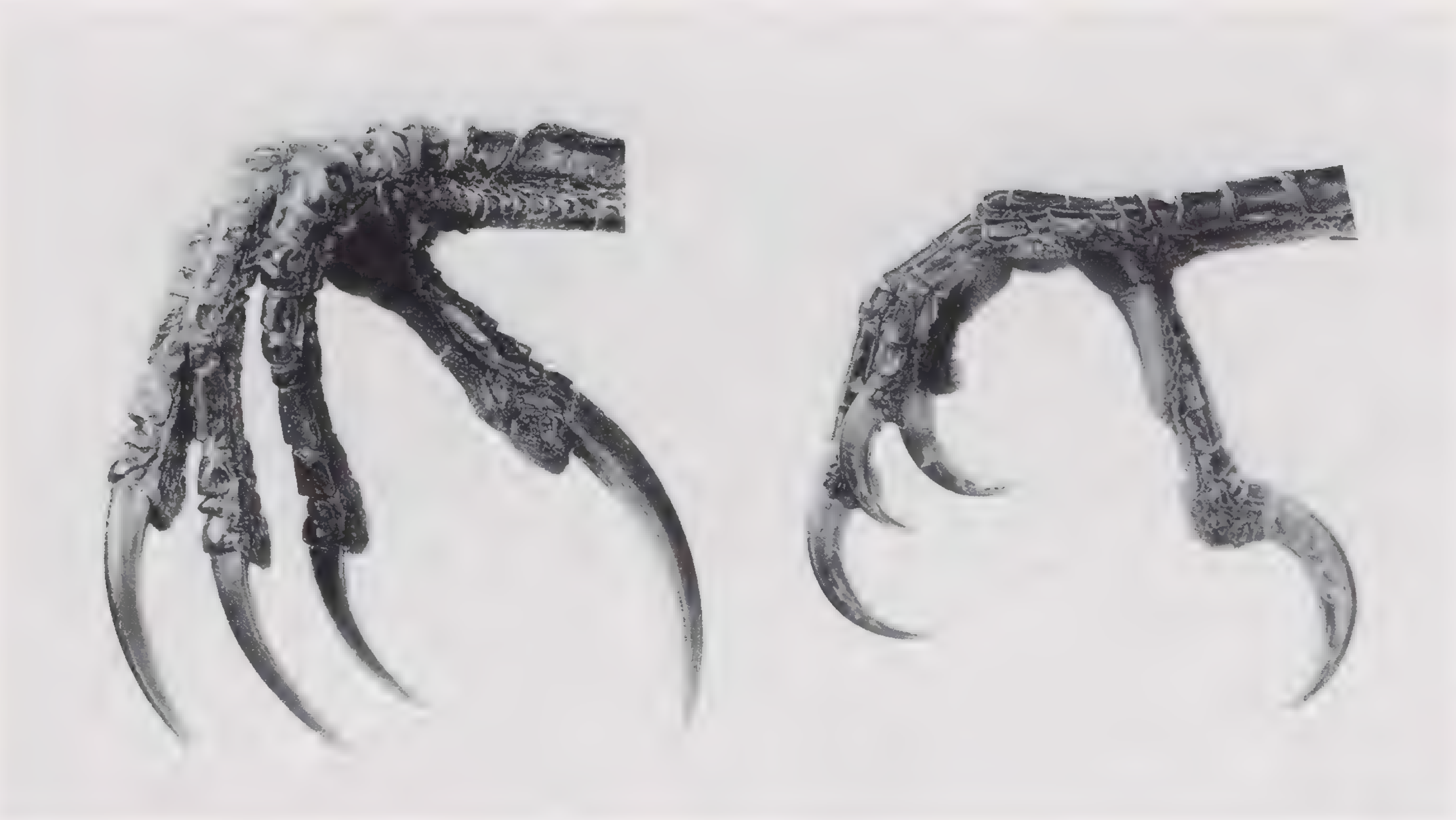
I remember a day in 1979 when I was finishing up some research on fossil birds at the Smithsonian Institution's Division of Birds in Washington, D.C. During a break, looking around the lab for something light to read, I noticed the April issue of *Johns Hopkins Magazine*. The cover featured a drawing of two dinosaurs; one of them, *Deinonychus* (the famous "terrible claw"), was depicted with a feathered back. "It's a caricature," I thought, "a wild notion."

But the idea of feathered dinosaurs is still popular today. Recently, feather-covered dinosaurs have appeared on the cover of *Time* magazine and in popular science magazines such as *Discover* and *Natural History*. In fact, feathered dinosaurs were given credibility last year by one of the world's premier scientific journals, *Nature*.

For the last two decades scientists have waged a great debate over the evolutionary origin of birds and the origin of bird flight. Ornithologists view birds and their feathers in a completely different light than do other scientists, particularly paleontologists. For ornithologists, birds are, as Roger Tory Peterson once exclaimed, "The most splendid expression of creation." They belong in the trees, and gracefully flying through the air, dazzling the viewer with an

At left, artist John O'Neill has created a living image of the fossil Archaeopteryx*, whose name means "ancient wing." Popular perception holds that the creature is the "missing link" between birds and dinosaurs, but the shape of the claws and the form of the feathers show this is a full-fledged bird, not a transitional form.*

ILLUSTRATION BY JOHN P. O'NEILL



The photograph above contrasts the straight claws of a ground-dwelling lyrebird, left, with the curved claws of a tree-perching bowerbird, right. Compare these images to the Archaeopteryx *foot, below right, figure A—it sports typical curved perching-bird claws.* Archaeopteryx *also had "hand claws," figure B; these resemble the claws of modern tree-climbing woodpeckers.*

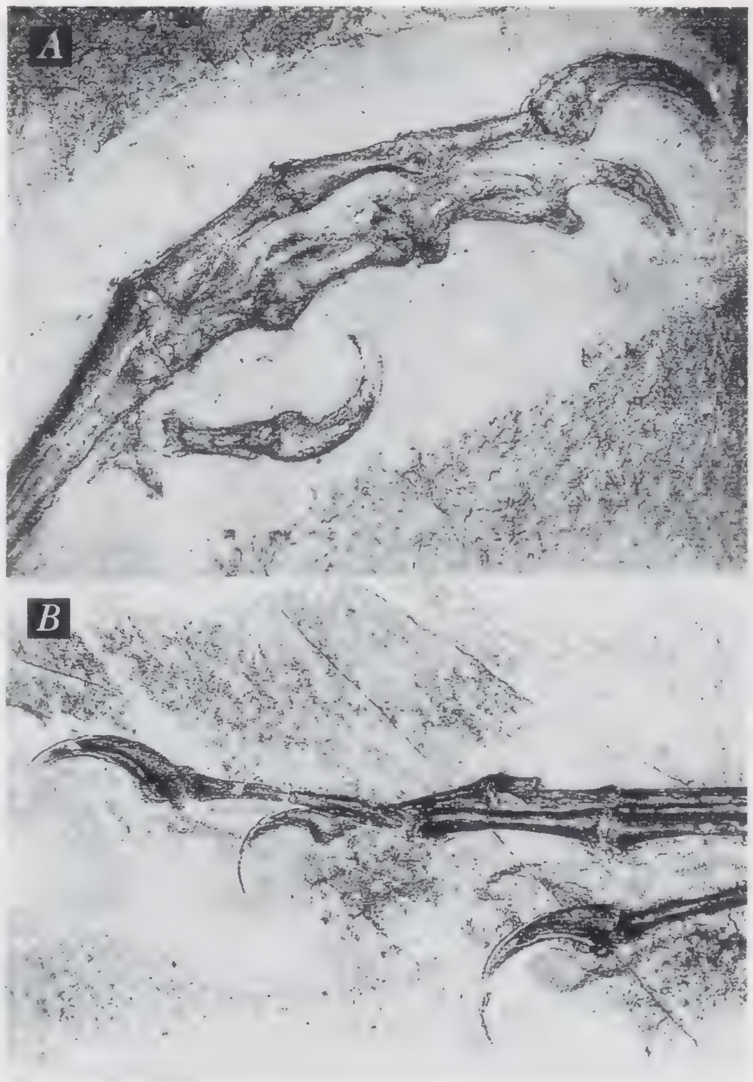
almost endless variety of beauty. To ornithologists, the fossil record shows that birds originated in the trees. The study of these unique creatures focuses on one central theme: their adaptations for flight.

The debate over the ancestry of birds and the origin of flight has become quite acrimonious, with open hostility breaking out in respected journals. The battle is often fought at a personal level, with vitriolic writing more suited to the legal profession than to distinguished scientists trying to arrive at something approximating the truth. Just what is it about this debate that has led to such intractable positions, that show no signs of resolution?

Several decades ago paleontologists led by Yale University's John Ostrom revitalized the theory that dinosaurs are the ancestors of birds. They saw similarities between certain dinosaurs such as *Deinonychus* and the first known bird, the 150-million-year-old *Archaeopteryx.* This primitive bird (the Germans called it the *urvögel*) began to be viewed not as a bird, but as a dinosaur that had somehow, mysteriously, acquired feathers. Modern birds were simply modified descendants of formerly earth-bound dinosaurs.

The debate consolidated as scientists from two arenas took sides. Paleontologists said *Archaeopteryx* represented an early, terrestrial stage in the evolution of bird flight. At first they argued that the *urvögel* could not fly, but later conceded that it may have been a weak flier that made short jumping or gliding flights up from the ground. Ornithologists, on the other hand, said birds began to fly from the trees down. Most never questioned whether *Archaeopteryx* was a bird; it was primitive, to be sure, but a tree-dwelling, flying creature, with fully developed feathers and a wishbone to which the flight muscles attached.

In light of new evidence from a seventh *urvögel* skeleton, recently discovered in the famous Solnhofen limestone quarry in Bavaria, some paleontologists have finally conceded that *Archaeopteryx* may have been capable of limited powered flight. But for them *Archaeopteryx* is still little more than a feathered dinosaur. Many articles in the scientific literature have argued that feathers evolved as insulation for hot-blooded dinosaurs. And because birds evolved from ground-dwelling dinosaurs, they reasoned, flight must have originated from the ground up. Popular magazines embraced the idea; a 1978 *National Geographic* article proclaimed, "*Archaeopteryx* supports two theories: warm-blooded dinosaurs and the dinosaurian ancestry of birds." Yale University paleontologist John Ostrom described *Archaeopteryx* as a terrestrial fly-swatter, saying its elongated wing feathers evolved as insect traps. Later, paleontologists classified *Archaeopteryx* and the coelurosaurian theropod dinosaurs—from which it was thought to be derived—in a new group, the *Maniraptora,* or "hand-raptors."



Courtesy Alan Feduccia and AAAS (3). These illustrations previously appeared in *Science,* vol. 259:790-793; 5 February 1993

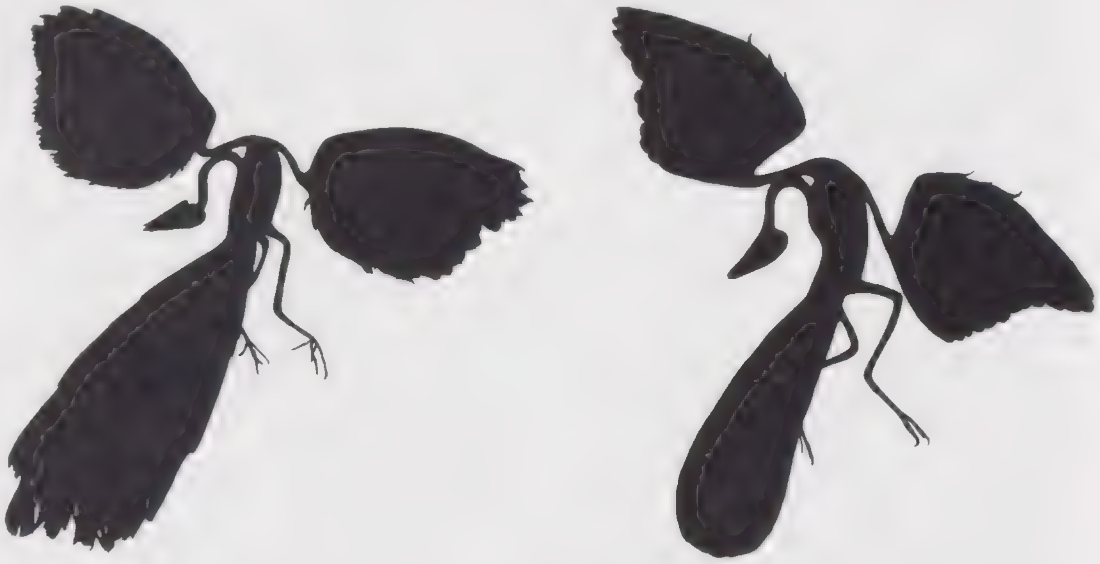
If hot-blooded, feather-insulated dinosaurs gave rise to birds, then the original purpose of feathers would have to have been for thermoregulation. Once they evolved, paleontologists argued, feathers could be used for other purposes, such as flight. In 1982 Harvard's famed evolutionary biologist Stephen Jay Gould and Yale colleague Elizabeth Vrba coined the term "exaptation" to describe structures that have been co-opted into their current use from a different, earlier use. Feathers were their prime example. According to Gould and Vrba, "the basic design of feathers is an adaptation for thermoregulation and, later, an exaptation for catching insects." So goes the sequence: hot-blooded dinosaurs have feathered insulation, the feathers elongate as insect traps, the animal runs and leaps and makes short flights, and then by some miracle the protobird soars off into the sunset.

In the meantime, Harrison B. Tordoff of the University of Minnesota and I examined casts of the *Archaeopteryx* fossils. We noticed that the primary feathers were virtually identical to those of modern birds—and not only with respect to structural details. The feathers were also asymmetrical. The vane on the leading edge, which parts the air in flight, is narrower than the rear vane. Such a design produces individual airfoils. Pick up a pigeon feather on the street and you will see this same structure. Modern birds that have become secondarily flightless, such as Ostriches, have symmetrical feathers; since natural selection is no longer operating to produce flight feathers, the feathers follow the simplest and least energetically demanding developmental pathway.

When we published our finding in *Science* in 1979, many people were amazed to read evidence that *Archaeopteryx* was a flying bird. But in fact, the critical evidence that *Archaeopteryx* could fly was available more than 130 years ago. A single feather discovered in 1861, presumably from *Archaeopteryx*, was the first evidence that true birds lived in the late Jurassic. This feather had these same asymmetrical vanes.

Last year I published a study in *Science* that I hope will help lay the *Archaeopteryx* issue to rest. I had previously noticed that the curved claws of the *Archaeopteryx* resembled those of a typical perching bird, not the flattened claws of a ground-dwelling bird. I went to the Smithsonian Institution's Division of Birds, photographed more than 500 bird feet, and measured the claw arcs. These measurements showed that ground-dwelling birds such as chickens and larks can be distinguished from other birds by their claw-arc alone. Their flattened claws are designed for walking on the ground. Perching birds have more curved claws, and trunk-climbers such as woodpeckers have very strongly curved claws. Where did *Archaeopteryx* fit?

The claws of its feet fit perfectly in the middle of the range of claw-arcs for perching birds, and the claws of its "hand" fit nicely in the middle range of the trunk-climbing birds. The hand claws of the *urvögel* are laterally compressed, with needle points; dinosaur claws are more conical and smoothly tapered. Derek Yalden of the University of Manchester had already noted in 1985 that the compressed claws of *Archaeopteryx* are similar to those of tree-climbing mammals and birds.

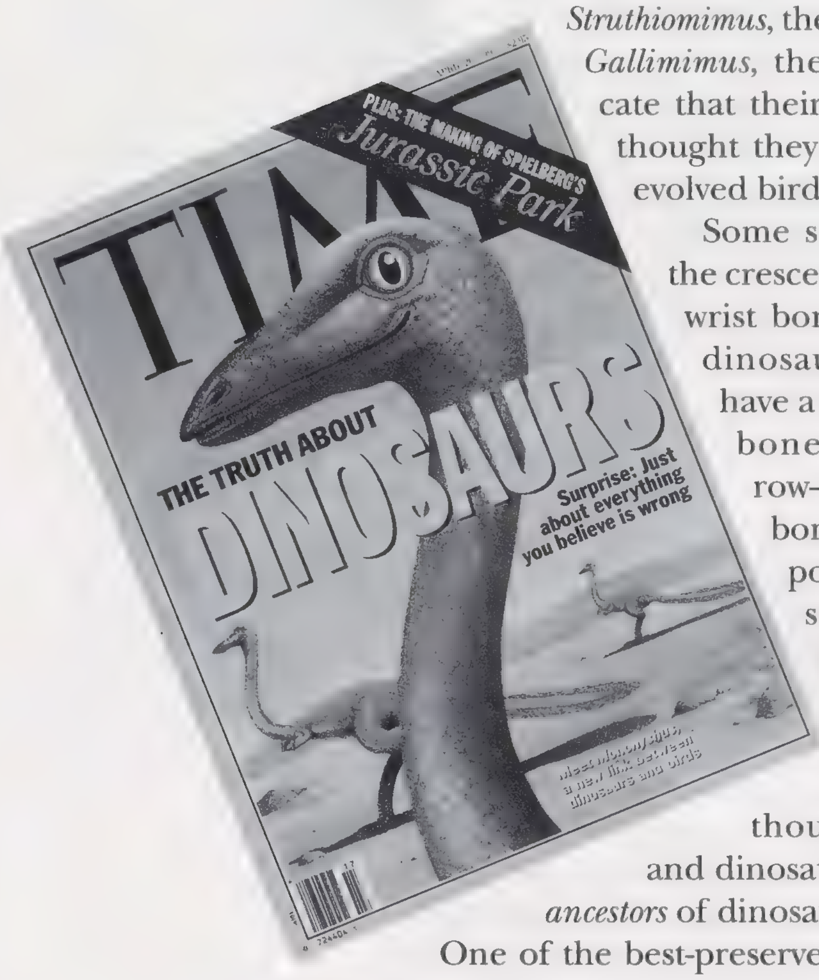


Above, Archaeopteryx*, on the right, superficially resembles a ground-dwelling modern bird, the Australian Pheasant Cuckoo. But the ellipitical wings, compact tail, and especially, curved claws of* Archaeopteryx *suggest a tree-dwelling lifestyle.*

In sum, *Archaeopteryx* was not a feathered, ground-dwelling insect-eater but a perching bird, one that used its hand claws to climb tree trunks and to balance itself as it clung to branches; it hadn't achieved the posture of a modern perching bird. Although *Archaeopteryx* could climb it may have done so only occasionally, after flying to the ground. It probably couldn't take off from the ground, so it climbed to reach a launching place. Like a glider, it took advantage of the energy provided by gravity, instead of fighting gravity from the ground up. My colleague Larry Martin of the University of Kansas often says, "An *Archaeopteryx* on the ground was dinosaur meat." The *urvögel* was a tree-dweller, not a terrestrial fly-swatter.

The supposed similarities between *Archaeopteryx* and dinosaurs have been greatly overrated; in reality, the *urvögel* is much more birdlike than scientists had previously thought. For example, *Archaeopteryx* has a well-developed hallux, or reversed first toe—an adaptation for perching in trees. No dinosaur has a reversed hallux. *Archaeopteryx* also has a well-developed wishbone. This structure is an adaptation for flight; it serves as a spring-spacer as well as an anchoring site for flight muscles. A few dinosaurs of the late Cretaceous period have a structure that resembles a wishbone, but it is generally considered to be a different structure. In *Archaeopteryx* the position of the shoulder blades also resembles that of modern flying birds; the arrangement makes the recovery stroke of the wing more efficient. This obvious flight adaptation is not known in any dinosaur. The *Archaeopteryx* wing itself is the elliptical wing of modern woodland birds, from warblers to woodcocks, designed to be efficient at low to moderate speeds. Finally, as mentioned above, the *urvögel*'s feathers are those of a modern bird, to the most microscopic detail, unchanged in 150 million years. There can be no doubt that *Archaeopteryx* was a bird in the modern sense, capable to some degree of powered flight.

Archaeopteryx really tells us nothing about the origin of flight or feathers. Hardly the first bird, it was well along the way to becoming a modern bird. Most of the supposed similarities between the *urvögel* and dinosaurs are seen in birdlike dinosaurs that lived 80 to 100 million years later, in the late Cretaceous. I and many others think these similarities are the result of convergent evolution. Even the names given to these dinosaurs—for example, *Ornithomimus,* the bird mimic, *Struthiomimus,* the Ostrich mimic, and *Gallimimus,* the fowl mimic—indicate that their original describers thought they had independently evolved birdlike characteristics.


TIME
PLUS: THE MAKING OF SPIELBERG'S Jurassic Park
THE TRUTH ABOUT DINOSAURS
Surprise: Just about everything you believe is wrong
Meet Mononykus, a new link between dinosaurs and birds

Some scientists argue that the crescent shape of a certain wrist bone unites birds and dinosaurs. But dinosaurs have a double row of these bones, birds a single row—and this particular bone has only been reported in three dinosaurs, two of which lived in the late Cretaceous period. Most of the other characteristics thought to unite birds and dinosaurs are found in the *ancestors* of dinosaurs, the thecodonts.

One of the best-preserved late Triassic thecodonts, *Postosuchus,* which was described by the famous Texas paleontologist Sankar Chatterjee, exhibits many of these features, such as an upright pubic bone and hollow, light bones.

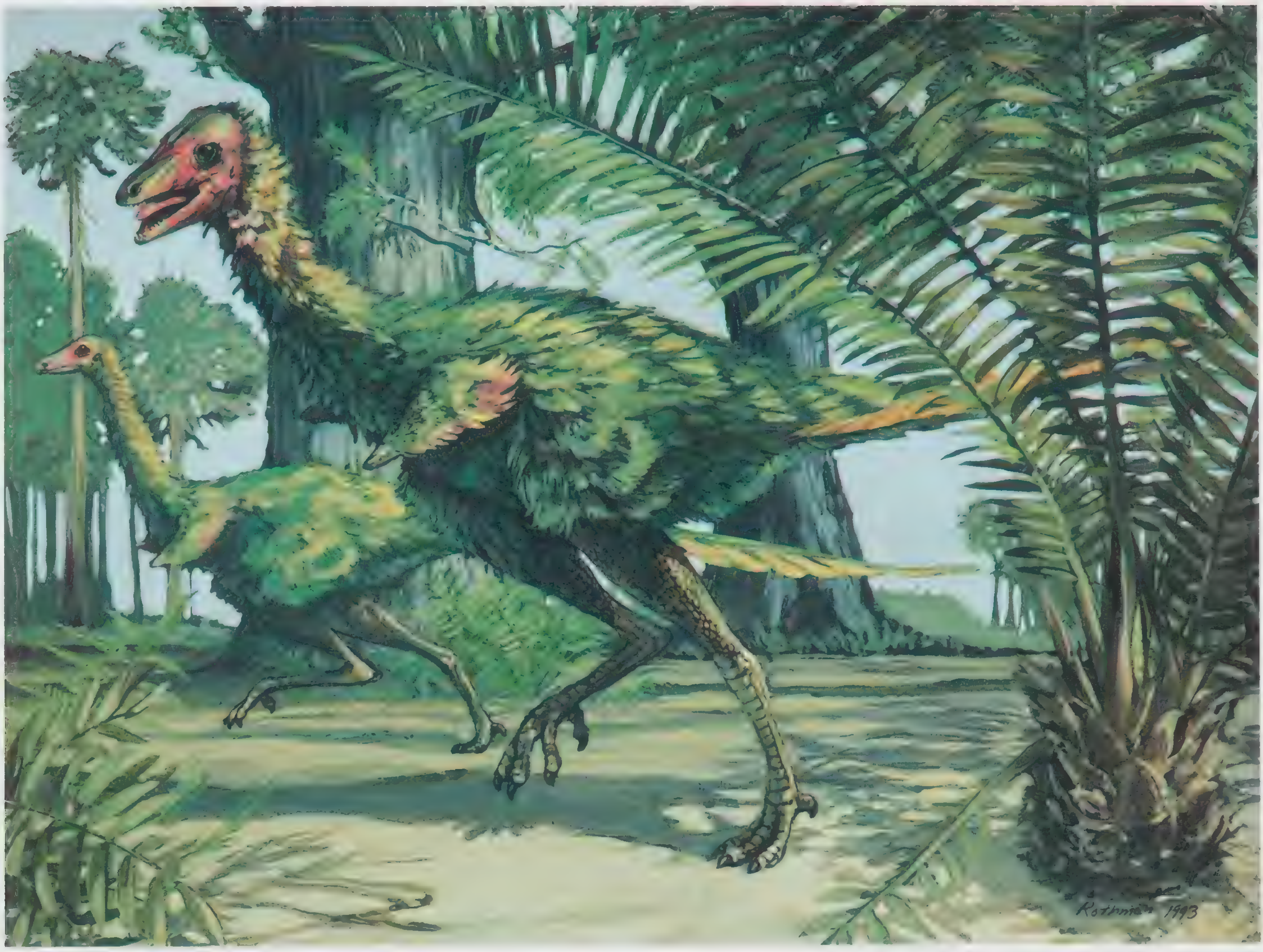
Why did feathers evolve, if they didn't serve as insulation? Small, tree-dwelling thecodonts would benefit from feathered forelimbs when they jumped from limb to limb. The feathers would produce drag and help to break the fall. This model, which I call the aerodynamic model for the origin of feathers, treats these unique structures as a direct adaptation for flight, not an exaptation. The beauty of the aerodynamic model is that it proposes that feathers evolved directly for flight, their modern anatomical function. The model works for the small, arboreal protobird, but against a terrestrial one. In a terrestrial dinosaur, the feathers would produce drag, but they would slow the animal down and prevent flight from the ground up.

Thus, when paleontologists depicted a recently discovered late-Cretaceous dinosaur, the small theropod *Mononykus,* as a feathered, terrestrial bird, many of us ornithologists had our feathers ruffled. *Mononykus*'s discoverers claim that it has birdlike features not found in *Archaeopteryx,* such as a breastbone with a keel and fused wrist bones. According to a writer for *Nature,* "it indicates a transitional position between *Archaeopteryx* and all other birds . . . Feathers may, therefore, have been widespread among bipedal carnivorous dinosaurs as an insulating outer layer . . . down feathers must have arisen initially as a means of insulation, in the lineage of maniraptoran theropod dinosaurs from which birds arose."

The preeminent expert on ancient birds, Storrs Olson, of the Smithsonian Institution's Division of Birds, studied the creature and declared in a *New York Times* interview, "It's a very interesting dinosaur, but there's no way that thing could be a bird." The keeled breastbone doesn't resemble that of birds, but it is very much like that of a mole, and is probably associated with a digging function, not any birdlike actions. *Mononykus* also has many typical theropod dinosaur features, including a large "dinosaur" tail, a small head, and no collarbones, to mention but a few. *Mononykus* was no bird.

With scant evidence, the describers of *Mononykus* developed two new theories of bird evolution: 1) that the common ancestor of *Archaeopteryx* and modern birds had a limited degree of powered flight, but that ability was later lost in the lineage leading to the mononykosaurs; and 2) the original bird ancestor was flightless, and the ability to fly evolved first in the *Archaeopteryx* lineage, then again in the lineage leading to modern birds, after mononykosaurs split off from the latter line. In other words, contrary to all ornithological thought, bird flight evolved twice!

The assertion that many dinosaurs were feathered, and that the main purpose of down was as insulation, raises some questions. For example, why assume that down would be good insulation for dinosaurs? It would immediately become soggy, mucky, and useless. Young Ostriches often die if their parents don't protect them from the rain. Furthermore, on even the most primitive birds, feathers are arranged in sparse rows, with broad areas of bare skin in between. If the early primary role of down was insulation, we'd expect a continuous covering of feather follicles, at least in the embryo. And why expect down feathers in dinosaurs when these feathers are secondary in modern birds?



MICHAEL ROTHMAN

Scientific debate rages over the recent discovery of a small dinosaur called Mononykus. *Paleontologists say it was feather-insulated, as in the illustration above, and a transitional species between* Archaeopteryx *and other birds;* Time *magazine announced the discovery by putting a feathered* Mononykus *on the cover, shown at left. But ornithologists disagree with this interpretation, saying the bone structure strongly suggests a molelike, digging dinosaur.*

Other questions relate to feather structure. Why use feathers, which are easily the most complex structures ever produced by the vertebrate skin, to insulate earthbound dinosaurs? Simple hairlike structures would be just as good. In birds that have become secondarily flightless, such as kiwis, the feathers assume a "hairlike" appearance. And why should feathers that are used only for insulation have the aerodynamic structure of flight feathers? Virtually every structural detail of feathers in birds, both living and extinct, has aerodynamic design.

Feathers, with their almost magical structural design, would be overkill as dinosaur insulation. To clothe a ground-dwelling, hot-blooded reptile with feathers for insulation would be like insulating an ice truck with heat shields from the space shuttle. The evolutionary origin of feathers is most easily explained in the context of what I call "feather-assisted jumping." According to this model, feathers evolved directly for flight, their current primary function. Each successive microevolutionary stage was fully adaptive.

The April 26, 1993, issue of *Time* magazine, which featured a feathered *Mononykus* on the cover, reported on recent revelations in paleontology, including hot-blooded, feathered dinosaurs; galloping, 40-foot brachiosaurs with six hearts; and cute dinosaur babies with snub noses and large eyes that inspired dinosaur mothers to develop caring behavior. These dinosaur portrayals, beyond the realm of science, should be considered carefully in light of the existing evidence. ■

Alan Feduccia, S.K. Heninger Professor at the University of North Carolina, is an evolutionary biologist interested in bird evolution. He is the author of 10 books and monographs, including the widely acclaimed The Age of Birds *(Harvard University Press, 1980). His new book on bird evolution will appear in 1995.*

Further Reading

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Hecht, M.K., J.H. Ostrom, G. Viohl, and P. Wellnhofer, eds. *The Beginnings of Birds*. Eichstätt, Germany: Freunde des Jura-Museum; 1985.

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PROJECT FEEDERWATCH

by Rick Bonney

Tracking trends in winter bird numbers is serious science . . . and it's fun

The Cornell Lab of Ornithology and the Long Point Bird Observatory (LPBO) were ahead of their time. Long before NAFTA—eight years, in fact—the two organizations, one from the United States, one from Canada, were already trading freely. But the imports and exports show up in the gross national product of neither country, because the commodity being traded is not hard goods. It's information—data on the kinds and numbers of birds found in backyards across North America.

Perhaps you've heard of Project FeederWatch. Maybe you're even among the 9,000 participants scattered across every U.S. state (except Hawaii) and every Canadian province (even the Yukon Territory).

GREGORY K. SCOTT

Across North America, people of all ages are flocking to study their backyard birds through Project FeederWatch.

But did you know that Project FeederWatch was the first bird count to document the ranges of North American feeder birds throughout the winter? To learn which winter species are most abundant? And to track the movements of irruptive species?

Begun in 1986, the project now stands as one of the world's most successful efforts to collect long-term bird data over a wide geographic area. All the information has been gathered by dedicated volunteers, thousands of bird enthusiasts who have turned a hobby into a significant contribution to ornithology. These volunteers have contributed a database containing 311,686 records for seven winter seasons, and the pattern of winter bird distribution in North America is emerging.

Consider the Pine Siskin, among the most erratic of winter wanderers. FeederWatch data analyst Diane Tessaglia says it's always interesting to see what Pine Siskins do each winter.

"In the winter of 1987-1988, siskins were everywhere. The next year, they were virtually absent from the eastern and central parts of the continent, the typical invasion regions. Then during the next two winters they repeated this pattern, so over those four years, we had an up-down, up-down pattern.

"But in the next two winters, something interesting happened. The siskins didn't appear to invade in the same manner. In 1991-1992 the Northeast, South Central, and Southwest regions had lots of siskins, but the Southeast and North Central regions had very few. In 1992-1993 the West Coast region had record-high numbers of siskins, whereas the Northeast region approached record low numbers.

"So this year, I was particularly curious to see where the siskins would be. It turns out the same asynchronized invasions of the past few winters were repeated again. Before FeederWatch began, we had no way of tracking such movements."

Lots of other information has come to light, too. For example, the most widespread species at winter feeders is the Dark-eyed Junco. House Sparrows have become less numerous over the last seven years; American Goldfinches have appeared at more feeders. Perhaps most important, numbers of winter birds that visit feeders seem fairly stable overall. Many of these species do not seem to be experiencing the population declines shown by some neotropical migratory birds.

Valuable as these population data are, they are not the only useful information collected by FeederWatchers. For example, project participants have also studied predation at feeders and the effects of window kills.

Erica Dunn reported on the predation study, which included 946 reports of predation incidents, in the Spring 1991 issue of *FeederWatch News.* "Sharp-shinned Hawk was the most frequent predator, accounting for 26 percent of the incidents in which the predator could be identified. Cooper's Hawk . . . accounted for an additional 12 percent of the captures. In addition to raptors, at least 12 other bird species, including American Crow, Scrub Jay, and various owls, preyed on feeder visitors. Altogether, avian predators accounted for 77 percent of all prey captures reported. Cats . . . did most of the rest." This information was also reported in the Winter 1994 issue of the *Journal of Field Ornithology,* a scientific publication.

The information contained in the vast data banks of the Project FeederWatch computer is just beginning to be mined. André Dhondt, the Lab's newly arrived Edwin H. Morgens Professor of Ornithology, says he's looking forward to working with the project.

"It is clear that we will soon be able to answer a variety of interesting questions with the FeederWatch data that can't be answered with any other data," says Dhondt. "For example, how does variation in the social organization of birds affect the patterns that become apparent in irruptions? In invasion areas, birds that defend territories in winter, such as nuthatches, do not become much more numerous on a single feeder, but appear at a larger number of feeders. Do finches, which feed in flocks, simply show up in larger flocks at the same feeders in invasion years? Or do they also visit more feeders? We are now thinking about how the FeederWatch data can answer such questions, in addition to tracking trends as we are already doing."

Recent evaluations of Project FeederWatch are causing some structural changes to the program. The semiannual *FeederWatch News* has recently been folded into the Lab's quarterly newsletter, *Birdscope*, to communicate more frequently with participants, make FeederWatch results accessible to more people, and entice more birders to join. And for the 1994-1995 season, the FeederWatch instruction booklets and data forms are being revised to make them easier to understand and fill out, and to make them more comprehensive.

"We're going to include tips on selecting feeders, setting up feeding stations, and understanding bird behavior," says FeederWatch coordinator Margaret Barker. "We'll suggest more studies that people can try with their feeder birds. Also, each participant's packet will include our beautiful new feeder bird identification poster, painted by Larry McQueen."

One of the biggest problems with FeederWatch, according to Ken Rosenberg, chief scientist for the Lab's Bird Population Studies, is that some participants don't realize that recording no birds at their feeders is just as important as recording lots of birds.

"Some people get discouraged when they see few birds at their feeders, and they may feel like it's a waste of time to fill in the data form," says Rosenberg. "But for the scientists analyzing the data, it's just as important to know where the birds are absent as where they are common in a given winter. And taking a long-term perspective, it's safe to say that if you have few birds this year, don't be discouraged; chances are you'll have more next winter."

All the staff involved in Project FeederWatch are looking forward to many more years of data collecting and analysis. They are also looking forward to doubling or even tripling the number of participants, especially in the Midwest, the Southwest, the prairie provinces, and Alaska, where participation is still sparse.

One of the best reasons to participate in Project FeederWatch is for simple enjoyment. Says one participant from Williamsport, Pennsylvania, "Thank you for Project FeederWatch. It makes winter so much more interesting—especially for a retiree." Says another, from Chillicothe, Missouri, "I'm recovering from surgery and radiation treatment. This FeederWatch has been wonderful therapy." From Essex, Ontario: "Thank you for providing a 'method for my madness' for bird-feeder watching every winter." From Hopatcong, New Jersey: "My second-grader FeederWatchers beg to stay in for recess so they can watch the birds." And over and over participants say, "It's nice to know that my small input can help in a real scientific study."

Michael Bradstreet, executive director of LPBO, believes that FeederWatch has a long and productive future. "Tracking changes in bird populations across the geography of North America is a daunting task," says Bradstreet. "Project FeederWatch is a great example of such important work getting done because people from all walks of life, all across the continent, are willing to work together to learn more about birds. The combination of professional design, volunteer involvement, coverage through the season, rigorous analysis, and international cooperation puts the project in a league of its own.

"Besides, it's fun!" ■

MARIE READ

If you've seen the FeederWatch logo, you'll recognize its popular subject—a White-breasted Nuthatch like the one pictured above.

Please Join Project FeederWatch

The project depends on participants' fees for sustenance: in the United States the annual cost is $14 ($12 for Lab members); in Canada the cost is $16 Canadian. U.S. participants, please send your name, address, and check to Project FeederWatch, Cornell Lab of Ornithology, P.O. Box 11, Ithaca, New York 14851-0011 or call 1-800-843-BIRD with a credit card number. Canadian participants, please send your name, address, and check to Project FeederWatch, Long Point Bird Observatory, Port Rowan, Ontario, N0E 1M0. Special note for educators: Try FeederWatch with your classes. Write to the Lab of Ornithology for our "Educator's Guide to FeederWatch."

Picture Perfect

A CAMERA FOR ALL SEASONS

Text and photographs by Tim Gallagher

Finding a camera that can stand the rigors of bird photography

Each year we receive dozens of letters from Lab members asking us to publish articles about bird photography. In response, we're starting a new column, "Picture Perfect," which will appear twice a year in these pages. To launch the column, we're presenting this excerpt from editor-in-chief Tim Gallagher's new book, Wild Bird Photography, *scheduled to be released this October by Lyons & Burford Publishers of New York.*

The first question most people ask when they decide to take up bird photography is: "What kind of equipment do I need?" So many different kinds of cameras and lenses are available, all loudly touted by company advertisements. How can I be sure I'm getting the best equipment for my purposes? Though selecting camera equipment is not easy, if you read this article and take time to analyze your own particular needs in bird photography, you should be able to narrow your search to a few equally good cameras.

Portability is the first thing to consider as you shop for a camera. Though some bird photographers take most of their pictures at home and aren't bothered by the weight and bulk of their equipment, most of us spend a lot of time trudging up and down hills and through marshes. In these situations, you'll want to use equipment that's relatively light and compact. This pretty well eliminates large- and even medium-format cameras. For a variety of reasons—comparatively low film price, acceptability by publishers, as well as the light weight of the equipment—35mm is the film size of choice with the majority of professional wildlife photographers. Another plus for this format is that most of the research and development carried out by major camera manufacturers is aimed at improving their 35mm cameras, developing better exposure meters, improved lenses, new technologies such as autofocus, and lighter, stronger camera bodies.

Of the 35mm camera types, the single-lens-reflex (SLR) is by far the best choice for bird photography. Most models accept a wide array of interchangeable lenses, from ultra wide-angle "fisheye" lenses to super telephotos. The SLR is distinctive in that the image travels through the lens, bounces off a mirror in front of the film, and up through a prism that deflects the image once more and directs it to the eye of the photographer. At the instant the shutter release is pressed, the mirror flips up, a focal-plane shutter curtain flies across, allowing light to hit the film for an instant, then the mirror snaps back into place. This unique design allows you to see the exact image that will appear in your photograph, which makes composing a picture and focusing easy and accurate.

Several companies manufacture acceptable 35mm SLR cameras. But taking a look at the company reputation, special features, available equipment, price, and the overall look and feel of a camera will point out the best choices. One thing to look at when shopping for a camera is the type of lens mount. In the past, many SLR cameras used screw-mount lenses, which were difficult and time consuming to change, and there was always the chance that you could cross-thread the lens if you rushed it, resulting in an expensive repair job. But most SLRs now use "bayonet mount" lenses. The touch of a button and a quick twist of the wrist is usually all you need to change a lens. But some bayonet mounts are better than others, so it's worth shopping around to find out what works best for you.

Most major camera brands—Nikon, Canon, Minolta, Olympus, Pentax, and others—have 35mm SLR cameras suitable for bird photography. But before buying a particular brand, look at the optional equipment available. Does the manufacturer offer an extensive line of lenses for use in a variety of situations, or do they only have a handful of optional lenses for their cameras? Remember, you're buying more than a camera, you're buying into a lens system. You want to get into a system that can grow with you as your special needs change. The fact that the majority of professional wildlife photographers use either Nikon or Canon equipment is largely because of the extensive lines of interchangeable lenses the two companies produce.

Be sure to get a camera with a built-in exposure meter. That way you won't have to carry a separate hand-held light

meter to determine the correct exposure. Automatic exposure control is also a handy feature, leaving you free to focus and compose your pictures without constantly having to adjust your aperture setting or shutter speed to compensate for changing light conditions. If you do buy a camera with automatic exposure control, make sure that the exposure can also be set manually. Some situations in nature photography can fool an automatic exposure system. Taking properly exposed pictures of birds in flight is difficult for some automatic systems. The light meter takes a reading from the brightly-lit sky in the background rather than from the dark-colored bird you're photographing, and you end up with a silhouette. In this case, it's better to take a meter reading from another object of similar color or reflective quality as the bird—the ground, some foliage, rocks—and set the exposure manually. Some cameras have "matrix" exposure metering systems that analyze diverse lighting conditions, automatically compensating for bright backgrounds and other difficult lighting situations.

Interchangeable focusing screens are another handy feature on an SLR camera. Stock focusing screens usually have a split-image rangefinder in the center of the viewfinder. The two halves of the image move together or apart as you turn the focusing collar on your lens. When the images are perfectly aligned, your subject is in perfect focus. But these focusing devices can be a nuisance if you're using a telephoto lens. Looking through most long lenses, the split image becomes a dark spot at the center of the image. With practice, it's quicker and easier to focus by eye using a blank focusing screen. The first thing I do when I buy a new camera is to replace the stock focusing screen. I sometimes use a screen that has a grid of horizontal and vertical lines etched on it. This makes it easier to line up the horizon correctly in my pictures.

Motordrives are useful in bird photography. Although you may shoot up more film if you use one, a motordrive eliminates wasted motion and time. While photographing a restless bird, time is critical. Even if you don't need a motordrive at present, you should buy a camera that will accept an optional motordrive in case you need one in the future. Though motordrives can be noisy, they rarely scare birds away. More often, the sound of a motordrive snaps a bird to attention, causing it to pause for a second and look up—an excellent time to take a couple more photographs.

Many cameras now have built-in motordrives or autowinders. In the past, I preferred cameras with removable motordrives so that I'd have the option of advancing the film manually while photographing a particularly nervous bird. It was also nice to be able to take off the motordrive and leave it at home on those occasions when I had to pack lightly. I must say, however, that some of the latest cameras have whisper-quiet motordrives—actually more quiet than most manual advance cameras—and are very light and compact. Try out a few models at the camera store, comparing speed, efficiency, and quietness, then decide for yourself.

I'm often asked about autofocus cameras. Autofocus was something I resisted for several years, but since I bought a Nikon F4S, which has an excellent automatic focus system, I find I'm using it more and more. It's been especially useful for taking quick shots of shorebirds running up and down the beach. I've also taken some excellent pictures of flying birds using autofocus.

The final consideration in the choice of a camera is the overall durability of the product. Let's face it, any camera equipment used for photographing wildlife does get knocked around a little in the field. If you really get into this as a hobby or profession, you'll probably be slogging through marshes, climbing trees, or crawling through dense vegetation before you know it. Take a close look at the camera you intend to buy. Does it really look like it will hold up under field conditions? You know better than anyone else the kind of abuse your camera is likely to face.

Whether you're crawling through a marsh to photograph an avocet, below left, or lying in a hot blind in the middle of a pelican colony, above, you need a rugged, dependable camera.

Many cameras now are made primarily of plastic. That in itself is not necessarily a bad thing—some high-impact plastics are rugged—but I think a camera needs to at least have a metal interior framework to make it tough enough for bird photography. If you're in doubt, look at product brochures of the camera you're thinking of buying. They often list construction materials. Also try to find a product review of the camera in *Consumer Reports* or one of the many photography magazines. You can find back issues of these publications and a reference list of articles at most public libraries. If you take the time to do a little research on your own and talk to other photographers in the field, you should be able to find a camera that will fit your needs now and in the future as your skill in bird photography grows. ■

The Catbird Seat

THE WISDOM OF THE WORTHIES, PART II

by Pete Dunne

I stepped up to the counter of the Cedarville Diner and was halfway through an order for "coffee black . . ." when a voice from the back shouted, "IT'S HIM. THAT BIRD FELLAH." Before I could add ". . . to go," I found myself wedged into a corner booth with Bob Henschel, the dairyman, Phil Sayre, a farmer, and Alan Corson, the mayor—members of the town's ad hoc breakfast think tank.

Every morning at seven, Cedarville's worthies gather to discuss the ills of the world—and it's a shame world leaders don't take advantage of their privileged council. It had been two years since I'd invited the assemblage to consider the merits of letting heard-only birds count on a birder's life list. The ensuing debate (summarized in the Autumn 1992 installment of this column) went from obtuse to metaphysical—went everywhere but to a conclusion. Nobody had paid any attention when I left. I didn't expect anyone to notice that I'd returned. I was wrong.

"Where's Reverend Johns?" I inquired.

"Down in The Valley," the mayor said.

"What valley?" I asked.

"The valley where the Collared Forest-Falcon is," he replied. "The Rio Grande Valley," he added (just in case I really was as stupid as the pitch in his voice implied).

"What's he doing down there?" I asked, somewhat startled.

"He needs the bird for his North American list," the mayor explained. "Don't most people?"

"THE REVEREND JOHNS IS A BIRDER?" I screeched.

"Uh huh," Phil Sayre said, breaking in. "Except he prefers 'bird watcher.' Me and Bob and Alan there are partial to 'birder' ourselves. He get it yet?" he asked Alan.

"Heard it, ain't seen it," Alan confirmed. "Said he was going to stick there until he saw it—which brings us back to that discussion we had two years ago . . . ."

"YOU GUYS ARE *BIRDERS!*" I said, astonished. The last time we'd met, the lot of them couldn't tell a hawk from a hand saw.

"That's right," the mayor replied. "Figured we'd never find an answer to that question of yours unless we understood birding. Turns out we kind of took to it."

"Alan," Bob Henschel said, "we ain't got time to sit here jawing this morning."

"Dang, I know it . . . ten minutes max," Mayor Corson said. "Mister," he said, looking at me, "you couldn't a picked a worse morning. But there ain't no tellin' when we'll get another opportunity, so let's just get to it. The way we figure it, forcing people to see a bird to count it is bound to set up situations where birds is going to get stressed. Take Black Rails," he continued. "You're familiar with Black Rails, ain't you?"

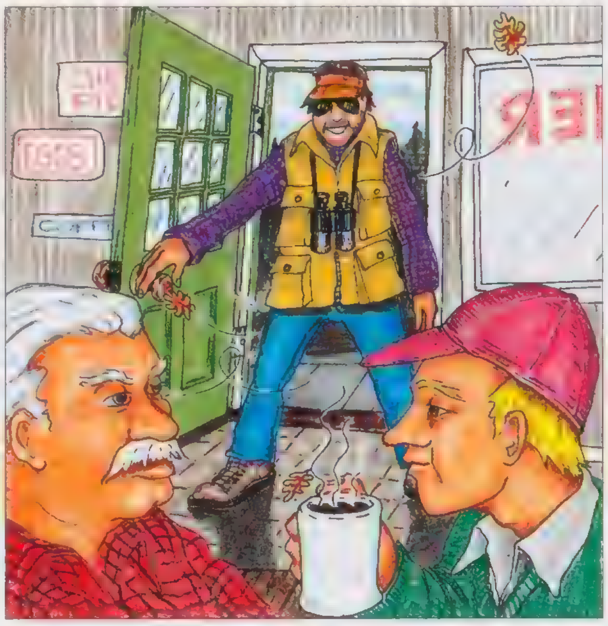

ILLUSTRATION BY JEFF SIPPLE

I nodded dumbly.

"Well, draggin' marshes with ropes to get a glimpse of them in daylight raises hell with salt marsh nesting birds. It's en-vi-ron-mentally disruptive. And it's our opinion that ensuring the welfare of birds should be a birder's first consideration; should be . . . what was that term the reverend used?"

"A priori," Phil offered. "Know what that means?" he said, addressing me, ignoring my affirmative nod. "It means rock bottom."

"It's Kantian," I offered.

"Ain't he the guy who wrote that field guide about advanced birding?"

"No, that was another guy," I said. "Immanuel Kant was a philosopher."

"Sounds foreign. Did he keep a North American list?"

"I don't think so," I said.

"You'd think a man that ethical would have been a birder," said the mayor. "Anyway," he continued, "that's how we see it. People will want to see birds most times an' that's fine. We just don't think people should be forced to see birds when common sense says it's bad for 'em. You agree?"

I couldn't do anything but nod.

"Fine," the mayor said. "That's settled. Now, you got to excuse us 'cause we got an important meeting and then we're heading up to Pedricktown to see Ruffs. Need 'em for our year lists." Without waiting for a reply the trio reached under the booth, exhuming piles of documents with titles like: "Projected Rise in Medicare Costs." Then Phil and Bob began arguing about "Universal Coverage," and from the way they started in you could tell it was an old argument.

To get my coffee, I had to reach over a battery of raincoat-clad figures who had commandeered the counter. At the door stood a man in aviator sunglasses who alternately interrogated me and said "affirmative" into a two-way radio.

An army of state troopers stood in the street, coalescing around a woman in a blue suit who was just stepping out of a stretch limousine. Walking smartly up the steps of the diner, she paused and spoke to the man with the radio.

I was too far away to pick up the conversation, but I think I heard something about calling Bill and reminding him to change the litter for Socks. And then, though I'm not certain, I thought I heard her ask him to confirm the tides at Pedricktown. ■

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What is a *cloacal kiss*?
What is the heaviest flying bird?
Which *land bird* undertakes the longest migration?
Which bird nests at the lowest altitude?
At what altitude was the highest-flying bird recorded?
Which bird was sacrificed to facilitate man's race to the moon?
What are halcyon days?
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From the introduction by Arnold Small

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